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New U.S. Patent Application

Title: MEDIUM FOR STORING AUDIO/IMAGE INFORMATION AND
MANAGEMENT SYSTEM THEREOF

Inventor(s): Hideo ANDO and Masafumi TAMURA

Sir:

We enclose the following papers for filing in the United States Patent and Trademark Office in connection with the above patent application.

1. A check for \$1,432 representing a \$1,392 filing fee and \$40 for recording the Assignment.
2. Application - 96 pages, including 12 independent claims and 19 claims total.
3. Drawings - 17 sheets of formal drawings containing 19 figures.
4. Declaration and Power of Attorney.
5. Recordation Form Cover Sheet and Assignment to Kabushiki Kaisha Toshiba.

Applicants claim the right to priority based on Japanese Application No. 11-275570, filed September 29, 1999.

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Please accord this application a serial number and filing date and record and return the Assignment to the undersigned.

The Commissioner is hereby authorized to charge any additional filing fees due and any other fees due under 37 C.F.R. § 1.16 or § 1.17 during the pendency of this application to our Deposit Account No. 06-0916.

Respectfully submitted,

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MEDIUM FOR STORING AUDIO/IMAGE INFORMATION AND
MANAGEMENT SYSTEM THEREOF

5 This application is based upon and claims the
benefit of priority from the prior Japanese Patent
Application No. 11-275570, filed September 29, 1999,
the entire contents of which are incorporated herein by
reference.

The present invention relates to an improvement of an information storage medium capable of recording and/or reproducing memory card, disc (phase changed optical disc, magneto-optical disc, or magnetic disc, etc.) or the like.

In addition, the present invention relates to a method for reproducing information recorded in the information storage medium.

As a removable and portable information storage

medium for recording digital audio information, there exists:

(A) CD-DA (compact disc having digital audio recorded in a pit shape);

5 (B) CD-I (CD interactive) or video CD;

(C) DVD (digital versatile disc) video or DVD audio disc (phase changed recording);

(D) MD (disc utilizing magneto-optical recording); and

10 (E) solid audio (semiconductor memory card such as flash memory) or the like.

With respect to the shape of information storage medium, the above (A) to (D) has a disc shape. In these information storage mediums, convergent laser beam(s) is(are) emitted to a recording layer on a medium while the medium is being rotated, and a change in the reflection light is detected as a reproduction signal.

15 In contrast, the above (E) may have any size and/or shape, but roughly has a card shape. In the (E), digital audio information is recorded in a semiconductor memory (mainly flash memory) incorporated in the card shaped body so that audio information is recorded and/or reproduced via electrode terminals provided at a predetermined portion of the card surface.

25 The CD-DA in the above (A) is used exclusively for

reproduction or playback. A user cannot add new audio information, and cannot edit audio information already recorded on an information storage medium. Further, this CD-DA has a format which does not support recording of still image information on the information storage medium.

In contrast, each of the CD-I or video CD of the above (B) and the DVD video or DVD audio of the above (C) has a format which enables to reproduce audio information, and at the same time, to display still image. However, since both of them are exclusive for reproduction only, it is impossible not only to add new audio information by a user, but also to edit the audio information already recorded on the information storage medium.

On the other hand, in MD of the above (D), new audio information can be recorded in the information storage medium by the user, and edit processings such as "combining music (Combine)", "dividing music (Divide)", and "Moving music (Move)" can also be performed.

However, MD does not have such a format that a still image can be displayed simultaneously during audio information reproduction.

Apart from package media of the above (A) to (C), in recent years, there becomes popular a system in which digital audio information compressed by MP3

(MPEG audio layer 3) or AAC (MPEG audio advanced audio coding) is distributed on the Internet, the compressed audio information is recorded in a memory card (mainly flash memory) of the above (E) on a receiving party,
5 and the recorded memory card is reproduced while the user is carrying it.

In this case, the user can record new audio information in the memory card, and can edit recorded audio information. However, in this case as well, at
10 present, it does not have such a format that a still image according to audio information can be recorded or edited.

As in CD-I, video CD or DVD audio, the market strongly desires introduction to an audio system
15 capable of reproducing audio information, and at the same time, displaying still image information, and further, capable of recording or editing new audio information by a user.

In addition, in this system, edit functions of a
20 grade such as "Combining music" or "Dividing music" are required.

However, after "Combining must" or "Dividing music" has been performed, in the case where audio information is reproduced in units of music, it is very
25 difficult to determine a method for selecting still image information to be displayed simultaneously and a timing of displaying each item of the still image

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information.

For example, assume a case wherein music number $\# \alpha$ and music number $\# \beta$ having the same reproduction time periods have been recorded, 20 still images are
5 displayed during reproduction of music number $\# \alpha$ while these images are changed within a short period of time, and only one still image is continuously displayed during reproduction of music number $\# \beta$.

In the case where music number $\# \alpha$ and music number
10 $\# \beta$ are combined by editing to make music number $\# \gamma$, if the first 20 still images are displayed to be changed within a short period of time during reproduction of music number $\# \gamma$, and only the last one image is continuously displayed for a long period of time, the
15 user feel strange.

In addition, in the case where music number $\# \theta$ is divided into music number $\# \iota$ and music number $\# \kappa$, there is a problem with how to set still images displayed in music number $\# \iota$ and music number $\# \kappa$,
20 respectively.

There does not exist, including the aforementioned MD (by which editing after recording is possible), any format (or specification) which explicitly indicates the guidelines for an optimal method of displaying
25 still images (or still pictures) after edit processing such as "Combining music" or "Dividing music" has been performed.

BRIEF SUMMARY OF THE INVENTION

This invention has been made in view of the foregoing circumstance, and has its primary object to provide an information storage medium capable of having information (image pointer information) on which guidelines are imparted as to how to display still images (or still pictures) after edit processing such as "Combine" or "Divide" has been performed for the recorded audio information (music).

A second object of the present invention is to provide a method for reproducing information recorded on the above information storage medium.

A third object of the present invention is to provide a method for editing information recorded on the above information storage medium.

In order to achieve the foregoing first object, in an information storage medium having a recording region for audio information and image information, there is defined a first reproduction unit (music) for reproducing the audio information (AOB) and a second reproduction unit (C/AOB/IOB/TK) having fineness equal to or less than the first reproduction unit (music).

The first reproduction unit (music) is composed of one or more second reproduction units (C/AOB/IOB/TK).

In this information storage medium, there is recorded management information (CI/AOBI/IOBI/TKI) concerning the second reproduction unit (C/AOB/IOB/TK).

5 At least one item of the management information
(CI/AOBI/IOBI/TKI), on which a reproduction
relationship between the audio information (AOB) and
the image information (IOB) is described, includes
information (IPI#) for specifying image information to
10 be displayed when the audio information is reproduced
in the first reproduction unit (music) which includes
the second reproduction unit (C/AOB/IOB/TK).

15 identification information (ID) specific to individual
information storage mediums.

20 the encoded (encrypted) information in the case where
information to be recorded is encoded (encrypted).

25 the medium and an apparatus for recording information
in or reproducing information from the medium.

The audio information (AOB) recorded in the

information storage medium according to the present invention can include a predetermined header and digital audio information compressed by a predetermined method (such as MPEG2/AAC). This predetermined header is stored in a region not encrypted, and the compressed digital audio information is stored in an encrypted region in predetermined encrypting units.

Further, the information storage medium according to the present invention can have a recording region for audio information (AOB) and text information (TOB).

Here, a first reproduction unit (music) for reproducing the audio information (AOB) and a second reproduction unit (C/AOB/TOB/TK) having fineness equal to or less than the first reproduction unit (music) are defined.

The first reproduction unit (music) is composed of one or more second reproduction units (C/AOB/TOB/TK).

In this information storage medium, there is recorded management information (CI/AOBI/TOBI/TKI) concerning the second reproduction unit (C/AOB/TOB/TK).

In the management information (CI/AOBI/TOBI/TKI), a reproduction relationship between the audio information (AOB) and the text information (TOB) is described.

At least one item of the management information (CI/AOBI/TOBI/TKI), on which a reproduction relationship between the audio information (AOB) and

the text information (TOB) is described, includes
information (TPI#) for specifying text information to
be displayed when the audio information is reproduced
in the first reproduction unit (music) which includes
5 the second reproduction unit (C/AOB/TOB/TK).

In order to achieve the second object, in a method
for reproducing an information storage medium having
a recording region for audio information and image
information, there is employed an information storage
10 medium having a recording region for audio information
(AOB) and image information (IOB).

The storage medium comprises a first reproduction
unit (music) for reproducing the audio information
(AOB) and a second reproduction unit (C/AOB/TK) having
15 fineness equal to or less than the first reproduction
unit (music).

The first reproduction unit (music) is composed of
one or more of the second reproduction units
(C/AOB/TK).

20 Management information (CI/AOB/TKI) concerning the
second reproduction unit (C/AOB/TK) is recorded in the
medium.

A reproduction relationship between the audio
information (AOB) and the image information (IOB) is
25 described in the management information (CI/AOBI/TKI).

When audio information (AOB) is reproduced in
the first reproduction unit from the medium, image

information (IOB) to be displayed is determined by utilizing the management information (CI/AOBI/TKI).

In addition, image information to be displayed when audio information is reproduced in the first reproduction unit (music) is determined by utilizing information (IPI#) recorded in management information (AOBI#) which relates to the second reproduction unit reproduced first in the first reproduction unit (music).

In order to achieve the third object, in a method for editing an information storage medium having a recording region for audio information and image information, there is employed an information storage medium.

In the medium, audio information (AOB) and still image information (IOB) are recorded, and management information (AOBI) indicative of a reproduction relationship between the audio information (AOB) and the still image information (IOB) is also recorded.

The recorded contents include a first reproduction unit (music) for reproducing the audio information (AOB) and first audio information.

The recorded contents further include first management information (AOBI#) for specifying still image information reproduced simultaneously when the first audio information is reproduced in the first reproduction unit (music); and second management

information (AOBI#) for specifying still image
information reproduced simultaneously when second
audio information, different from the first audio
information, is reproduced in the first reproduction
5 unit (music).

By employing the information storage medium,
the first audio information and the second audio
information can be combined to produce third audio
information which forms a new first reproduction
10 unit (music).

Then, third management information corresponding
to the third audio information can be recorded on the
information storage medium (ST300).

Further, in still image information specified in
15 the third management information, it is possible to
include all (ST302) or at least part (ST304) of the
still image information specified in the first
management information (AOBI#), and all (ST302) or at
least part (ST304) of the still image information
20 specified in the second management information (AOBI#).

In addition, in the third audio information, when
the first audio information is reproduced earlier than
the second audio information, the recording place of
the third management information can be utilized
25 compatible with the recording place of the first
management information.

If a summation of the still image information

specified in the first management information (AOBI#)
and the still image information specified in the second
management information (AOBI#) exceeds a predetermined
value (ST304), the total number of still image
5 information specified in the third management
information is reduced to the predetermined value.

Thereafter, the information (IPI) for specifying
the reduced still image information is recorded at
a portion corresponding to the first management
10 information (AOBI#) in the third management information
(AOBI#).

Then, the information (IPI) for specifying still
image information (rejected image(s)) other than still
image information specified in the third management
15 information (AOBI#) is recorded at a portion
corresponding to the second management information
(AOBI#) in the third management information (AOBI#).

Further, in order to achieve the third object, in
a method for editing an information storage medium
20 having a recording region for audio information and
image information, there is employed an information
storage medium in which audio information (AOB) and
still image information (IOB) are recorded, and first
management information (AOBI#) indicative of a
25 reproduction relationship between the audio information
(AOB) and the still image information (IOB) is also
recorded.

The recorded contents include a first reproduction unit (music) for reproducing first audio information (AOB).

5 The recorded contents further include first management information (AOBI#) in which recorded is specifying information (IPI#) for specifying still image information reproduced simultaneously when the first audio information is reproduced in the first reproduction unit (music).

10 In this medium, the first audio information is divided into second audio information reproduced in the first reproduction unit (music) and third audio information reproduced in the first reproduction unit (music) (ST400).

15 In addition, second management information (AOBI#) corresponding to the second audio information and third management information (AOBI#) corresponding to the third audio information are set (ST400).

20 The specifying information (IPI#) recorded in the first management information (AOBI#) is recorded in the second management information (AOBI#) and the third management information (AOBI#) (ST402).

25 The image information (image object IOB) is generally composed of one or more mutually independent still images (still pictures) whose contents are different from each other. However, when a still image (such as JPEG compressed image or I-picture portion of

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MPEG compressed image) is recorded in a medium, the recording mode for the medium is not always limited to a concept of still image in consideration of a stage at which such image is displayed.

5 For example, let us consider a case wherein a computer graphic (CG) image of 8 bit plain, capable of performing color display using a 256 color palette, is included in image object IOB. In this case, when the 256 color palette used for the CG image display is
10 sequentially changed with an elapse of time (or when the color palette is cycled), even if original data is a still picture, part of the display screen (a portion at which color cycling is performed) is seen as if it were moving.

15 Alternatively, for example, let us consider another case wherein 15 continuous images (each of which is a still picture) are recorded in a medium, these recorded images are fetched to a video memory, and the fetched images are then continuously
20 reproduced. In this case, when 15 continuous images are repeatedly reproduced with a rate of 5 images per second, for example, these images are seen as if they were slow motion images of 5 frames/second, looped at intervals of three seconds.

25 That is, in a broad sense including a visual point of view when a user actually sees an image(s), the above image information (image object IOB) is not

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limited to a fixed still image or still picture.

Additional objects and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may
5 be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out hereinafter.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

10 The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate presently preferred embodiments of the invention, and together with the general description given above and the detailed description of the preferred embodi-
15 ments given below, serve to explain the principles of the invention.

FIG. 1 is a view illustrating a case wherein a plurality of music numbers are recorded in an information storage medium (memory card or disc)
20 according to an embodiment of the present invention, and the music numbers with still images (or still pictures) whose total is equal to or less than a predetermined number (in this case, 20) are combined by editing;

25 FIG. 2 is a view illustrating a case wherein a plurality of music numbers are recorded in the information storage medium (memory card or disc)

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according to an embodiment of the present invention,
and the music numbers having still images whose total
exceeds a predetermined number (in this case, 20) are
combined by editing; and a case wherein these plurality
5 of music numbers are divided after such combining;

FIG. 3 is a view illustrating a recording format
of a memory card that is an information storage medium
according to an embodiment of the present invention;

FIG. 4 is a view illustrating a recording format
10 of an optical disc that is an information storage
medium according to another embodiment of the present
invention;

FIG. 5 is a view illustrating a directory
configuration (hierarchical structure of recording
15 files) of a variety of information stored in the
information storage medium shown in FIG. 3 or FIG. 4;

FIG. 6 is a view illustrating an example of a
reproduction relationship (the arrows shown in the
figure) between a plurality of music numbers and still
20 images accompanying these music numbers stored in the
information storage medium shown in FIG. 3 or FIG. 4;

FIG. 7 is a view illustrating another example of a
reproduction relationship (the arrows shown in the
figure) between a plurality of music numbers and still
25 images accompanying these music numbers stored in the
information storage medium shown in FIG. 3 or FIG. 4;

FIG. 8 is a view illustrating an example of

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combined with each other;

FIG. 14 is a flow chart illustrating a specific example of "automatic selection of still image" to be performed in the step ST304 shown in FIG. 13;

5 FIG. 15 is a flow chart illustrating the edit processing when one music number of audio information with image information recorded in the audio card shown in FIG. 3 (or optical disc shown in FIG. 4) is divided into two sections;

10 FIG. 16 is a view illustrating an example of a reproduction relationship (the arrows shown in the figure) between a plurality of music numbers stored in the information storage medium shown in FIG. 3 or FIG. 4 and text (characters, signs, graphics and/or
15 marks) accompanying these music numbers;

 FIG. 17 is a view illustrating another example of a reproduction relationship (the arrows shown in the figure) between a plurality of music numbers stored in the information storage medium shown in FIG. 3 or
20 FIG. 4 and text (characters, signs, graphics and/or marks) accompanying these music numbers;

 FIG. 18 is a view illustrating a reproduction relationship (the arrows with dashed line shown in the figure) between a plurality of music numbers and still
25 images accompanying these music numbers in a case wherein cell information (CI#) shown in FIG. 6 is reread to a track search pointer (DPL_TK_SRP#), audio

object information (AOBI#) shown in FIG. 6 is reread to track information (TKI#), and image pointer information (IPI#) shown in FIG. 6 is reread as track information search pointer (TKI_IOB_SRP) for the image object; and

5 FIG. 19 is a view illustrating still another example of a reproduction relationship (the arrows shown in the figure) between a plurality of music numbers stored in the information storage medium shown in FIG. 3 or FIG. 4 and text (characters, signs,
10 graphics and/or marks) accompanying these music numbers.

DETAILED DESCRIPTION OF THE INVENTION

Hereinafter, preferred embodiments of the present invention will be described with reference to the
15 accompanying drawings.

FIG. 1 is a view illustrating a case in which a plurality of music numbers with still images (or still pictures) whose total is equal to or less than a predetermined number (in this case, 20) are combined
20 with each other by editing.

As shown in (a) of FIG. 1, music number $\# \alpha$ and music number $\# \beta$ are initially managed separately by audio object information AOBI#1 and AOBI#2. These AOBI#1 and AOBI#2 have image pointer information IPI
25 respectively, and are collected in audio object set information AOBSI.

As shown in (a) and (b) of FIG. 1, an audio

Here, let us consider a case in which a user has
5 issued an instruction for combining music number $\# \alpha$ and
music number $\# \beta$ to form one music number $\# \gamma$ (namely,
the user has performed Combine Edit processing).

More specifically, among from the information on a program chain (original PGC) indicative of the flow or sequence of an original audio program, the information corresponding to the image pointer information IPI of AOBI#1 and AOBI#2 is partially rewritten, and the rewritten information (IPI) is redefined as part of music number # γ .

When music number $\# \alpha$ with still images and music number $\# \beta$ with still images each having a configuration shown in (a) and (b) of FIG. 1 are combined, music number $\# \gamma$ with still images as shown in (c) of FIG 1 is produced.

ATS_01.AOB is specified by AOBI#1 included in combined
music number # γ , and ATS_02.AOB is specified by AOBI#2
included in combined music number # γ . Further, all
image objects (IMG_01.IOB to IMG_04.IOB) are specified
5 only by image pointer information IPI of AOBI#1
contained in music number # γ .

That is, when "Combining music" has been
performed, the content specified by image pointer
information IPI in AOBI#1 before combining and the
10 content specified by image pointer information IPI in
AOB#2 before combining are collectively recorded in
image pointer information IPI of the management
information (AOBI#1) corresponding to the audio
information file (ATS_01.AOB) to be reproduced first in
15 music number # γ .

Here, image pointer information IPI of AOBI#2
contained in music number # γ is not used to specify
an image object (IMG_01.IOB to IMG_04.IOB).

In other words, all image objects (IMG_01.IOB
20 to IMG_04.IOB) can be specified by image pointer
information IPI of AOBI#1 corresponding to a portion
(ATS_01.AOB) to be reproduced first during reproduction
of combined music number # γ . This is one of the
primary features according to the present embodiment
25 shown in FIG. 1.

According to the above feature, when combined
music number # γ is reproduced, it is unnecessary to

temporarily store management information (IPI) of AOBI#2 shown in (c) of FIG. 1 in a memory section (RAM) of system control section 3020 of the apparatus shown in FIG. 9 described later.

5 While memory saving can be thus ensured, only management information of AOBI#1 in (c) of FIG. 1 may be temporarily stored in the memory section (RAM) of system control section 3020. Then, from the stored contents of the memory section (RAM), the user can know
10 all of the still image file names of which still image(s) can be displayed during reproduction of music number # γ . Further, the user can know the timing of changing each still image file (or can know what is the number of audio frame to change a still image during
15 reproduction).

As a result, the required memory size of RAM in system control section 3020 shown in FIG. 9 can be reduced, and accordingly, the equipment manufacturing cost can be reduced.

20 FIG. 2 is a view illustrating a case in which a plurality of music numbers with still images whose total number exceeds a predetermined number (in this case, 20) are combined by edition, and a case in which these music numbers are divided after such combining.

25 In the case where 11 to 20 still image files are set by AOBI#1 and AOBI#2 shown in (a) of FIG. 1, respectively, a total number of still images after

"Combining music" has been performed exceeds the upper limit (20) per music number. The processing method in this case will be described with reference to FIG. 2.

After combining a plurality of music numbers ($\# \alpha$ and $\# \beta$ shown in (a) of FIG. 2), if a total number of still images for the combined music number ($\# \gamma$ shown in (b) of FIG. 2) exceeds the number (20) of displayable still images per music number, system control section 3020 shown in FIG. 9 described later properly mixes (or shuffles) information items recorded in image pointer information IPI#1 and image pointer information IPI#2 shown in (a) of FIG. 2 (or mixes/shuffles image pointers obtained after removing a duplicate specified portion(s) for the same still image).

Next, 20 image pointers for 20 or more mixed still images are sequentially selected from the top, and a maximum of 20 displayable still images per combined music number ($\# \gamma$) are selected.

Then, as shown in (c) of FIG. 2, the selected 20 still images are recorded in image pointer information IPI#1' of AOBI#1 of combined music number $\# \gamma$. Further, upon removing the duplicate specified portion(s) of the still images for the same still image, the deselected still images (excess of 20 images) are recorded in image pointer information IPI#2' of AOBI#2 reproduced later in the same music number $\# \gamma$.

By doing this, the still images to be displayed

when music number $\# \gamma$ is reproduced after music number $\# \alpha$ and music number $\# \beta$ have been combined are limited only to (20 pieces of) still images specified in image pointer information IPI#1' which is provided in
5 management information (AOBI#1) concerning the audio information file to be reproduced first in music number $\# \gamma$.

Here, if the user is not satisfied with a still image(s) selected by system control section 3020 shown
10 in FIG. 9 during combining process of music number $\# \gamma$, information exchange between image pointer information IPI#1' and image pointer information IPI#2' may be done, using still image specifying information (image pointer) being deselected (namely, rejected) and
15 recorded in image pointer information IPI#2'.

Such information exchange between image pointer information and IPI#1' and IPI#2' can be performed by an information recording/reproducing apparatus having advanced editing functions (or an advanced editor
20 machine), or by a personal computer (PC) in which a required application program(s) is/are installed.

Similarly, in a case where music number $\# \gamma$ with 20 or less display images (IPI#1') and more than 20 "rejected" image (IPI#2') is combined with music
25 number $\# \eta$ with 20 or less display images (IPI#3) and more than 20 "rejected" images (IPI#4), if a total number of still images targeted for display exceeds

a predetermined value (20), then 20 display images (IPI#1") of combined music number # θ are selected after shuffling the information items on image pointer information IPI#1' and on image pointer information IPI#3. The information (image pointer) indicative of the other "rejected" images is recorded in image pointer information IPI#2', IPI#3', and IPI#4 of AOBI#2, AOBI#3, and AOBI#4, respectively.

At this time, no change is made for the information (image pointer) in image pointer information IPI#2' and IPI#4. This is because the still images specified in image pointer information IPI#2' and IPI#4 are respectively associated with the contents of audio information files managed by AOBI#2 and AOBI#4.

As shown in (b) and (c) of FIG. 2, when music number # γ and music number # η are combined with each other to obtain music number # θ , and if the information item(s) (or image pointer(s) of the rejected image(s)) in image pointer information IPI#2' and IPI#4 is(are) kept unchanged, then, in the future, the user can select still image(s) which is(are) well matched with future-divided audio information (contents of the future-divided music), provided that after music number # θ is divided in the future, re-editing is performed by the aforementioned editor with advanced function or personal computer (PC).

If the above re-editing is not done, the "rejected" image(s) specified by image pointer information IPI#2', IPI#3' and IPI#4 shown in (c) of FIG. 2 is(are) not displayed when music number # θ is reproduced or when a music number (# ι or # κ shown in (d) of FIG. 2) obtained by dividing music number # θ is reproduced.

Now, a processing method when music number # θ is divided into two sections will be described.

Let us consider a case wherein music number # θ is divided into music number # ι and music number # κ in the middle of AOB#3 shown in (c) of FIG. 2, for example.

In this case, the audio information file corresponding to AOB#3 is divided into two sections. Then, AOB#5 ((d) of FIG. 2) corresponding to the audio information file to be lastly reproduced in divided music number # ι is created from the management information of AOB#3 not divided. The still image information displayed while divided music number # ι is reproduced is specified by image pointer information IPI#1" ((d) of FIG. 2) in AOB#1 corresponding to the first reproduced audio information file in music number # ι .

At this time, AOB#1 shown in (d) of FIG. 2 has the same image pointer information IPI#1" as AOB#1 shown in (c) of FIG. 2. That is, the information

on image pointer information IPI#1" shown in (c) of
FIG. 2 before division is inherited intact to AOBI#1
shown in (d) FIG. 2.

Similarly, AOBI#6 ((c) of FIG. 2) corresponding to
5 the first reproduced audio information file in divided
music number #κ is created from the management
information on AOBI#3 not divided. The still image
information displayed during reproduction of music
number #κ is specified by image pointer information
10 IPI#1" ((d) of FIG. 2) in AOBI#6.

At this time, AOBI#6 shown in (d) of FIG. 2 has
the same image pointer information IPI#1" as AOBI#1
shown in (c) of FIG. 2. That is, the information on
image pointer information IPI#1" shown in (c) of FIG. 2
15 before division is inherited intact to AOBI#6 shown in
(d) of FIG. 2.

The number of display images for music number #θ
not divided is originally limited to 20. Therefore,
even if image pointer information IPI#1" having the
20 information (image pointer) indicative of 20 images is
copied to divided music number #ι and music number #κ,
no problem will occur with respect to the number of
still images to be displayed.

There is a possibility that image pointer
25 information IPI#1" copied for still image display
during reproduction of music number #κ fails to include
the contents being matched with AOBI#6. In this case,

the user may perform re-editing using the
aforementioned editor with advanced function or
personal computer PC, whereby the content (image
pointer) of image pointer information IPI#1" can be
5 changed to match with the content (audio information
specified by AOBI#6) of divided music number #κ.

Incidentally, a method for combining and/or
dividing music number(s) described with reference to
FIGS. 1 and 2 is a processing method that conforms to
10 the data structure shown in FIG. 6 described later.
The combining and/or dividing processing shown in
FIGS. 1 and 2 can also be performed in conformance with
the data structure shown in FIG. 7 described later.
However, when the music combining and/or dividing
15 processing is performed in conformance with the data
structure shown in FIG. 7, it should be noted that
image pointer information IPI is recorded in cell
information CI rather than audio object information
AOBI.

20 FIG. 3 is a view illustrating a data structure
(recording format) of information recorded in audio
card (memory card) 100 that is an information storage
medium according to one embodiment of the present
invention.

25 The information storage medium (audio card or
memory card) shown in FIG. 3 is card shaped in size
equal to name card, planer gum or stamp. Electrodes

(not shown in FIG. 3) for connection with an external device (not shown in FIG. 3) are provided at a predetermined position outside of this card 100. As described later, through these electrodes, information is input to or output from an information reproduction apparatus or information recording/reproducing apparatus (cf. FIG. 9) using card 100 shown in FIG. 3.

A main body of audio card or memory card 100 is composed of, for example, a semiconductor IC having a 64 MB flash memory (EEPROM) incorporated with a microcomputer and its peripheral devices.

As shown in (a) of FIG. 3, audio card 100 has a copy protection function, thus making it possible to prevent illegal copy or illegal use of the information recorded in audio card 100.

More specifically, audio card 100 itself features the following for an external device (information production apparatus or information recording/reproducing apparatus) independently:

- (a) mutual authentication and encode key (encryption key) exchange;
- (b) encoded (encrypted) information input/output; and
- (c) utilization of normal information (decoded or decrypted information) by a party (information reproduction apparatus or information recording/reproducing apparatus) only which has been

recorded in recording region (RAM) 103 for the card specific ID information and key information.

Further, audio card 100 with the copy protection function has application data recording region

5 (RAM) 104. In RAM 104, there can be recorded audio information (audio object AOB), still image information (image object IOB), text information (text object TOB), and management information (AOBSI.IFO, IOBSI.IFO, and TOBSI.IFO shown in FIG. 5) for managing these items of
10 information.

As shown in (b) of FIG. 3, the inside of application data recording region (RAM) 104 is composed of boot information recording region 100, file allocation table (FAT) recording region 111, root
15 directory internal information recording region 112, and data region 113.

Here, an FAT format is applied to the file format of data to be recorded in application data recording region (RAM) 104.

20 When audio card 100 with the copy protection function of FIG. 3 is inserted into an information recording/reproducing apparatus (cf. FIG. 9), this information recording/reproducing apparatus reads the information recorded in boot information recording
25 region 110, and is booted (activated) automatically.

Thereafter, when the information recording/reproducing apparatus reproduces or plays

back desired information (music and still image or the like) from card 100, the apparatus reads the file allocation information in FAT recording region 111 so as to recognize the storage address of the desired information to be reproduced. Based on this address, the apparatus accesses application data recording region (RAM) 104.

In data region 113, audio related information recording region 121 and one or more general computer information recording region(s) 120 can be arbitrary mixed and set as shown in (c) of FIG. 3.

As shown in (d) of FIG. 3, audio related information recording region 121 is composed of: management information recording region 130; audio object (AOB) recording region 131; image object (IOB) recording region 132; and text object (TOB) recording region 133.

The audio information recorded in audio card 100 is stored in AOB recording region 131, the still image information recorded in audio card 100 is stored in IOB recording region 132, and the text information recorded in audio card 100 is stored in TOB recording region 133.

The management information (e.g., map information) concerning these audio information, still image information and text information, and the management information (e.g., search pointer) indicative of

the relationship between these items of information are stored in management information recording region 130.

The inside of management information recording region 130 is divided into four recording regions, as shown in (e) of FIG. 3.

More specifically, management information recording region 130 is composed of: program chain set information (PGCSI) recording region 140; audio object set information (AOBSI) recording region 141; image object set information (IOBSI) recording region 142; and text object set information (TOBSI) recording region 143.

PGCSI recording region 140 is composed of, as shown in (f) of FIG. 3, original PGC (ORG_PGC) information recording region 150 for storing original program chain information, and one or more user defined PGC (UD_PGC) recording regions 151, 152, ... for storing program chain information newly defined by the user during use of card 100.

ORG_PGC information recording region 150 is composed of, as shown in (g) of FIG. 3, recording region 160 for information indicative of a total number of cells (information units configuring the PGC) existing in an original PGC, and one or more cell information (CI) recording regions 161, 162,

In audio card (memory card) 100 having the above data structure, the recording contents such as music

information are stored in the predetermined places provided in recording regions 131 to 133 shown in (d) of FIG. 3. In addition, after the user has edited the stored recording contents (such as music combining, dividing, erasing, moving or the like), the management information (e.g., a method for reproducing the edited music number and the corresponding image and/or the corresponding text) is stored in the predetermined places provided in recording region 130 shown in (d) of FIG. 3.

According to the embodiment of the present invention, as memory card 100 with its copy protection function shown in FIG. 3, there is mainly proposed an audio card for recording audio information, image information, and/or text information protected from illegal copy and/or illegal use. However, memory card 100 shown in FIG. 3 is not limited to such audio information only, and can be utilized to record an application file (or PC data) such as a file of word processor or of spread sheet available for use in a general personal computer PC (the recording region for this purpose is denoted by reference number 120 in (c) of FIG. 3).

In this case, authentication/key exchange and I/O processing related control program stored in ROM 102 as well as card specific ID and key information stored in RAM 103, both shown in (a) of FIG. 3, may be properly

utilized so that illegal copy and/or illegal use of an application file (or PC data) of word processor, spread sheet, game, or the like can be prevented.

5 Namely, memory card 100 shown in FIG. 3 can be utilized as package media for distributing (with or without charge) a computer program (application program, game program or the like) to be protected from illegal copy and/or illegal use.

10 FIG. 4 is a view illustrating a recording format of an optical disc that is an information storage medium according to another embodiment of the present invention.

15 Although audio card (memory card) 100 shown in (a) of FIG. 3 is a card shaped medium in which the medium itself does not move mechanically while in use, medium 170 shown in (a) of FIG. 4 is a disc shaped medium in which the medium itself rotationally moves while in use.

20 Specific examples of disc shaped medium 170 capable of recording and reproducing include: hard disc HDD (in particular, HDD having its removable recording medium portion); a large capacity floppy disc drive FDD (in recent years, floppy discs of 100 MB or more in capacity is commercially available); a magneto-optical disc MO; DVD-RAM, DVD-R, DVD-RW, and the like.

25

Although the FAT format is adopted as a HDD or MO file format described by referring to (b) of FIG. 3, a

universal disc format (UDF) is adopted for DVD-RAM,
DVD-R, or DVD-RW.

Here, a data structure of disc shaped medium 170
will be described on the assumption of the DVD family
5 disc (for example, recording and reproducing DVD audio
disc) adopting the UDF format.

That is, read-in area 1800 is disposed at the
inner periphery of disc shaped medium 170, and read-out
area 1830 is disposed at the outer periphery thereof.
10 Volume and file structure information 1810 and data
region 1820 are disposed therebetween. Each of these
areas 1800 and 1830 and regions 1810 and 1820 contains
a rewritable data zone.

Rewritable data region 1820 shown in (b) of FIG. 4
15 has a hierarchical data structure as shown in (c) to
(g) of FIG. 4. This data structure is the same as that
described by referring to (c) to (g) of FIG. 3.

In the case of providing access to the information
(for example, a file with the directory structure as
20 shown in FIG. 5 described later) recorded in disc
shaped medium 170, volume and file structure
information 1810 is first reproduced. This volume
and file structure information 1810 contains UDF
information for providing access to the data file as
25 shown in FIG. 5.

FIG. 5 is a view illustrating the directory
structures (recording file hierarchical structures) of

a variety of information stored in memory card 100 shown in FIG. 3 adopting FAT or in disc shaped medium 170 shown in FIG. 4 adopting UDF.

5 The information recorded in application data recording region (RAM) 104 shown in (a) of FIG. 3 has a directory hierarchical structure as shown in FIG. 5, and the information contained in root directory 2000 shown in FIG. 5 is recorded in information recording region 112 provided in the root directory shown in (b) of FIG. 3.

10 Alternatively, the information recorded in data region 1820 shown in (b) of FIG. 4 has a directory hierarchical structure as shown in FIG. 5; and the information contained in root directory 2000 shown in FIG. 5 is recorded in volume and file structure information 1810 shown in (b) of FIG. 4.

15 Even in the case where audio card 100 with the copy protection function adopting the FAT format is used as an information storage medium as shown in FIG. 3, or even in the case where disc shaped information storage medium 170 adopting the UDF format as shown in FIG. 4 is used, information to be recorded in the information storage medium is recorded in unit of files, as shown in FIG. 5.

20 The audio information (AOB) with the still image (IOB) having been described with reference to FIGS. 1 and 2 is collectively recorded in sub-directory 2001,

called real-time audio recording directory 2100, as shown in FIG. 5.

This real-time audio recording directory 2100 has data file 2002 containing following files 2110 to 2140, 2310, 2320, 2500, ... as a sub-directory.

The audio information (audio object AOB) to be recorded in the information storage medium shown in FIG. 3 or FIG. 4 is recorded in unit of files such as ATS_01.AOB 2500, ..., as shown in FIG. 5. Details of audio object file (audio information file) 2500 will be described later by referring to FIG. 8.

This audio information file (ATS_01.AOB2500, ...) is recorded and stored in audio recording region 131 shown in (d) of FIG. 3 or (d) of FIG. 4.

In addition, the image information (image object IOB) to be recorded in the information storage medium shown in FIG. 3 or FIG. 4 is recorded as another file such as IMG_01.IOB 2310, ... for every image (still picture), as shown in FIG. 5.

These image information file (IMG_01.IOB 2310, ...) is recorded and stored in image object recording region 132 shown in (d) of FIG. 3 or (d) of FIG. 4.

Further, in the information storage medium shown in FIG. 3 or FIG. 4, text information (text object TOB) such as words for audio information (performed music), item description of performed music, or introduction of

performer can also be recorded in unit of files such as
TXT_01. TOB 2320, ..., as shown in FIG. 5.

These text information files (TXT_01. TOB
2320, ...) are recorded and stored in text object
5 recording region 133 shown in (d) of FIG. 3 or (d) of
FIG. 4.

All of the management information concerning the
audio information (audio object AOB) recorded in audio
object recording region 131 is collectively recorded in
10 one file 2120 named AOBSI.IFO, as shown in FIG. 5. The
recording place of this AOBSI.IFO file 2120 corresponds
to audio object set information AOBi recording region
141 in (e) of FIG. 3 or (e) of FIG. 4.

In addition, the management information concerning
15 still image information (image object IOB) recorded in
image object recording region 132 is collectively
recorded in file 2130 called IOBSI.IFO. The recording
place of this IOBSI.IFO file 2130 corresponds to image
object set information recording region 142 in (e) of
20 FIG. 3 or (e) of FIG. 4.

Similarly, the management information concerning
text information (text object TOB) recorded in text
object recording region 133 is collectively recorded in
file 2140 called TOBSI.IFO. The recording place of
25 this TOBSI.IFO file 2140 corresponds text object set
information recording region 143 in (e) of FIG. 3 or
(e) of FIG. 4.

Even in the case where any form of audio card 100 with a copy protection function and disc shaped information storage medium 170 is employed, all of the management information indicative of the reproduction sequence concerning all audio information (All AOBs) recorded in the information storage medium is collectively recorded in one file 2110 named PGCSI.IFO, as shown in FIG. 5. The recording place of this PGCSI.IFO file 2110 corresponds to program chain set information recording region 140 in (e) of FIG. 3 or (e) of FIG. 4.

Here, the program chain (PGC) is composed of one or more cells C as described later, and is structured so that the reproduction sequence of music numbers in PGC can be defined depending on the arrangement order of cells C.

When data of real-time recording/reproducing DVD video (DVD_RTR) is recorded in the data region of the medium shown in FIG. 3 or FIG. 4, DVD_RTR directory 2200 containing DVD_RTR data file(s) is(are) provided as a sub-directory of root directory 2000 shown in FIG. 5.

In addition, when DVD audio data is recorded in the data region of the medium shown in FIG. 3 or FIG. 4, DVD audio directory 2300 containing DVD audio data file(s) (ATS_01.IFO, ATS_01.AOB, or the like) is(are) provided as a sub-directory of root directory

2000 shown in FIG. 5.

FIG. 6 is a view illustrating an example of a reproduction relationship between a plurality of music numbers stored in the information storage medium shown in FIG. 3 or FIG. 4 and still images accompanying these music numbers. Hereinafter, the relationship between these items of management information will be described by referring to the figure.

In the embodiment of the present invention, all items of the audio information (All AOBs) recorded in the information storage medium are collected by units of "music numbers".

Further, the music numbers recorded in the information storage medium contain information of procedures (sequences) for which all the music numbers are reproduced sequentially and continuously. A region in which the first created sequence information (program chain PGC) is recorded is referred to as original PGC (ORG_PGC) information recording region 150 (cf. (f) of FIG. 3, (f) of FIG. 4, or (a) of FIG. 6).

The management information (AOBSI) concerning audio information (AOB) has respective separate management information units (AOBI#1 to AOBI#5) for individual audio information files (AOB files) such as ATS_01.AOB 221 to ATS_05.AOB 225 (each one corresponds to ATS_01.AOB 2500 shown in FIG. 5). As these management information units, as shown in (c) of

FIG. 6, there are set audio object information 171 (AOBI#1), 172 (AOBI#2), 173 (AOBI#3), 174 (AOBI#4), and 175 (AOBI#5).

Audio object information 171 to 175 (AOBI#1 to
5 AOBI#5) respectively have time map information 181 to 185 containing information indicative of a relationship between the reproduction time and the recording place (address) in the medium, in order to enable special reproduction such as time search, fast forward FF, or
10 fast rewinding FR.

According to the embodiment shown in FIG. 6, audio object information 171 to 175 (AOBI#1 to AOBI#5) respectively contain information of image pointer information 191 to 195 (IPI#1 to IPI#5), so that still
15 image information files IMG_01.IOB 231 to IMG_03.IOB 233 can be directly specified or designated from image pointer information 191 to 195 (IPI#1 to IPI#5).

As shown in (b) and (c) of FIG. 6, the size specified by cell information 161 to 165 (CI#1 to CI#5)
20 defined in original PGC information recording region 150 corresponds to all the reproduction range indicated by the corresponding audio object information 171 to 175 (AOBI#1 to AOBI#5) on the one-to-one basis.

As shown in (b) of FIG. 6, music number α 301,
25 music number β 302, and music γ 303 are composed of one or more cell information CI. The information of "which music number each cell information IC corresponds to"

is described in cell information 161 to 165 (CI#1 to CI#5), respectively.

As described previously, the reproduction sequence of the original PGC is defined depending on the arrangement order of the corresponding cell information CI. However, from the relationship with the music numbers shown in (b) of FIG. 6, the reproduction sequence (or reproduction steps) of each music number is resultantly described in original PGC information recording region 150.

Apart from the reproduction sequence indicated by the original PGC, unique reproduction sequence information defined or prepared by the user is recorded in user defined PGC recording region 151. Cell information 167 to 169 (CI#11 to CI#13) defined in user defined PGC recording region 151 is so configured that the corresponding audio object information AOBI (AOBI#3 to AOBI#5 in (c) of FIG. 6) can be set, and that the reproduction start time as well as reproduction end time in the time map information (TMI 183 to 185 in (c) of FIG. 6) defined in the AOBI can also be set.

Thus, by sequentially arranging the items of cell information CI shown in (b) of FIG. 6, arbitrarily, an optional reproduction sequence relevant to the audio information (audio object AOB) can be defined in user defined PGC recording region 151.

In an example shown in (b) of FIG. 6, cell

information 167 (CI#11) specifies part of time map
information 185. From this, the reproduction range of
music number # γ 313 reproduced by cell information 167
(CI#11) becomes narrower than the reproduction range of
5 music number # γ 303 defined in the original PGC. Only
such narrower range can be reproduced by cell
information 167 (CI#11).

In this manner, according to the embodiment of the
present invention, an arbitrary or optional range can
10 be reproduced without being limited to the reproduction
range of the music numbers defined in the original PGC.

Plural sets of arbitrary reproduction sequences
freely prepared by the user can be defined according to
user defined PGC recording region 151. The embodiment
15 of the present invention has such a structure that a
plurality of user defined PGC recording regions #A·151,
#B·152, ... can be provided, as shown in (f) of FIG. 3
or (f) of FIG. 4, for respective reproduction sequences
freely defined by the user.

20 In the embodiment shown in FIG. 6, image pointer
information IPI#2·192 is set such that two still
images (or still pictures) for IMG_02_IOB 232 and
IMG_03_IOB 233 are displayed during reproduction of
music number # β 302.

25 In the embodiment of the present invention, the
still image file information to be displayed by each
music number is described in image pointer information

IPI#2 (192 in FIG. 6; or 197 in FIG. 7) provided in audio object information 172 (AOBI#2) (cell information 162·CI#2 in FIG. 6 or FIG. 7) to be reproduced first in each music number.

5 FIG. 7 is a view illustrating another example of a reproduction relationship (the arrows shown in the figure) between a plurality of music numbers stored in the information storage medium in FIG. 3 or FIG. 4 and still images accompanying these music numbers.

10 Hereinafter, the matters different from FIG. 6 will be described.

 The embodiment shown in FIG. 7 has image object information 201 and 202 (IOBI#1 and IOBI#2) including management information items respectively relevant to
15 still image information files IMG_01_IOB 231 and IMG_02_IOB 232.

 Any of image pointer information 196 to 200 (IPI#1 to IPI#3 and IPI#13 to IPI#14) properly specifies image object information 201 and 202 (IOBI#1 and IOBI#2),
20 thereby providing a structure for specifying still image information files IMG_01_IOB 231 and IMG_02_IOB 232 to be displayed simultaneously during audio information reproduction.

 The embodiment of FIG. 7 is different from the
25 embodiment of FIG. 6 in that items of image pointer information 196 to 200 (IPI#1 to IPI#3 and IPI#13 to IPI#14) are disposed respectively in portions of cell

information 161 to 163, 169 and 170 (CI#1 to CI#3 and CI#13 to CI#14).

In the embodiment shown in FIG. 6, the still image information file to be displayed during reproduction of music number γ ' 313 and music number β ' 312, each defined in user defined PGC 151, coincides with the still image information file to be displayed during reproduction of music number β 302 and music number γ 303, each defined in original PGC 150. Thus, according to a data structure based on this embodiment, the still image information file displayed during reproduction cannot be arbitrarily set or freely changed.

In contrast, in the embodiment shown in FIG. 7, image pointer information IPI# is allocated by each cell information CI#, so that the still image information file displayed during reproduction can be set arbitrarily by each cell.

FIG. 8 is a view illustrating an example of a format (data structure) wherein encrypted audio information is recorded in, for example, the audio card with copy protect function shown in FIG. 3.

Hereinafter, a data structure in audio object file 2500 ((a) of FIG. 8) according to the embodiment of the present invention will be described.

The audio information (audio object AOB) is composed of audio objet units AOBU 2510 to AOBU 2530

((b) of FIG. 8).

These units (AOBU 2510 to AOBU 2530) are configured based on:

(01) dividing by specific data size (32k bytes,
5 16k bytes, 512 bytes, etc.) to provide divided units;

(02) dividing by a specific number of audio frame to provide divided units;

(03) dividing by reproduction time (0.2 second,
one second, 2 seconds, 5 seconds, 10 seconds, etc.) to
10 provide divided units; and so on

In the embodiment of the present invention, MPEG AAC system (advanced audio coding) is adopted for audio information compression.

As shown in (c) of FIG. 8, audio object file 2500
15 is composed of a set of plural audio frames 2610 to 2630.

The number of audio frames contained in each audio object file 2500 is described in audio object information AOBI. Therefore, the "total number of
20 frames for each music number" can be obtained by utilizing information relating to AOBI and the corresponding music number described in cell information CI.

The information of the "total number of frames
25 for each music number" is recorded in audio object information (for example, AOBI#2·172 in music number # β) corresponding to the audio information file

004150 2122950

to be reproduced first in the music.

In the AAC system, each inside of audio frames (AOB frames) 2610 to 2630 shown in (c) of FIG. 8 is composed of ADTS (advanced audio coding transport stream; or audio data transport stream) header 2710 and compressed audio information recording region 2740 shown in (d) of FIG. 8.

Further, ADTS header 2710 is composed of fixed header 2720 including AOB synchronizing words and variable header 2730 as shown in (d) of FIG. 8.

In a method for encrypting audio information (AOB), as shown in (e) of FIG. 8, the contents of ADTS header 2710 are placed in non-encrypting region 2810 (in a plain state being free from encrypting), whereas encrypting is sequentially done from the head position of compressed audio information recording region 2740 by encrypting units (#a to #f).

For example, computation processing is performed to the data in encrypting units (#a to #f) in accordance with an encryption key generated based on random numbers, and the computation result is recorded as encrypting information. Encrypting is performed in these encrypting units (#a to #f), and the computation processing based on the above encryption key is repeated by encrypting units (#a to #f).

In the embodiment of the present invention, the encrypting units (#a to #f) are defined in units of

64 bits or 56 bits. The size of compressed audio information recording region 2740 does not always coincide with a multiple of 64 bits. For this reason, in compressed audio information recording region 2740, only region "g" that is a remainder (a fractional portion) caused by dividing a multiple of encrypting units is maintained in a plain state being free from encrypting.

Namely, the non-encrypting region "g" is provided as a sort of a padding area for ensuring that the size of compressed audio information recording region 2740 is made coincident with a multiple of 64 bits.

Incidentally, encrypting region 2820 is formed of the encrypting units (#a to #f), and compressed audio information recording region 2740 is formed of encrypting region 2820 and the padding region "g".

FIG. 9 is a block diagram illustrating an example of an apparatus for recording or reproducing information for audio card (memory card) 100 with copy protect function shown in FIG. 3.

First, a configuration of a recording system capable of writing into audio card (memory card) 100 the information (audio information and/or still picture information) to be copy protected.

A digital camera is a popular device that digitally records still image information handled by the apparatus shown in FIG. 9. In addition to such

a digital camera, still image information to be
digitally recorded is utilized for menu images or
the like in a DVD video system for digitally
recording/reproducing movie information (I picture of
5 MPEG can be regarded as still image information).

As means for inputting such still image
information into the device shown in FIG. 9, there are:

(11) means for capturing into video capture
section 3510 an video signal from CCD camera 3610 or TV
10 tuner 3620 to convert a still image, and then,
converting into a digital signal the still image
captured by an A/D converter (not shown) incorporated
in video capture section 3510, to thereby input the
digital signal to switching section (data bus line)
15 3210 for input data transfer destination;

(12) means for transmitting the still image
information photographed by digital camera 3630 to
I/F processing section 3520 for the digital camera,
using, for instance, a serial transmission line such
20 as RS-232C, so that the transmitted information is
supplied to input data transfer destination switching
section 3210; and

(13) means for supplying, via inter-PC data I/F
processing section 3540, input data transfer
25 destination switching section 3210 with the still image
information (such as computer graphics) produced by
personal computer (PC) 3640 or the still image

(17) means for digitizing by ADC 3350 an analog audio signal inputted from voice input microphone 3650 via a microphone input terminal 3560, and subjecting the digitized data to MPEG2/AAC compression coding by audio encoder 3310 so as to input the coded data to input data transfer destination switching section 3210;

(18) means for subjecting to MPEG2/AAC compression coding by audio encoder 3310 a digital audio signal (for example, linear PCM digital output from a CD player) externally inputted via a digital input terminal 3580, and inputting the coded data to input data transfer destination switching section 3210; and

(19) means for directly capturing already-compressed digital audio information through WWW (World Wide Web) or Internet using a modem (not shown) and data input PC 3640, and inputting the captured data to input data transfer destination switching section 3210 via inter-PC data I/F processing section 3540.

Desired information (for example, JPEG compression still picture information from digital camera 3630, and MPEG compression audio information from audio encoder 3310) is selected from a variety of digital information inputted by the above method under the control of system control section 30020.

Then, the selected information (JPEG compression still picture information and MPEG compression audio information) is transferred to an information

recording and reproducing section 3000 through input data transfer destination switching section (data bus line) 3210.

For the audio input information or still image
5 information transferred to information recording and reproducing section 3000, information of analog copy generation management system CGMS-A may be accompanied in the case of an analog input signal; and information of digital copy generation management system CGMS-D may
10 be accompanied in the case of a digital input signal.

When information (2-bit flag) of "any frequent copying enabled, or copy-free" is described as the information of the copy generation management system CGMS, encode processing is not required. Then, the
15 input information is transferred from input data transfer destination switching section 3210 to information recording and reproducing section 3000, while the transferred input information is in a plain state being free of encrypting.

20 On the other hand, in the case where copy limitation is specified by CGMS-A or CGMS-D, the copy limited information is transferred from input data transfer destination switching section 3210 to encryption processing section 3110.

25 At encryption processing section 3110, copy limited information is encrypted based on the encryption key generated randomly by encryption key

generating/storage section 3140 (refer to (e) of FIG. 8 for the encrypting method).

The audio information and/or still image information encrypted by encryption processing section 3110 are/is transferred to mutual authentication/key exchange & encryption information I/F control section 3120.

From mutual authentication/key exchange & encryption information I/F control section 3120, the encrypted audio information and/or encrypted still image information are/is transferred to information recording and reproducing section 3000. The information transferred to information recording and reproducing section 3000 is accompanied with CGMS-A or CGMS-D copy limitation information (2-bit flag) as needed.

When the information of "only one generation copy enabled" is described as CGMS information, the encryption decode key (or decryption key) is accompanied with this CGMS information, and the encrypted audio input information as well as the decryption key with the CGMS information are transferred from mutual authentication/key exchange & encryption information I/F control section 3120 to information recording and reproducing section 3000.

When the information of "copying disabled, or copy never" is described as CGMS information, the encrypted

audio input information without the decryption key is transferred from mutual authentication/key exchange & encryption information I/F control section 3120 to information recording and reproducing section 3000, together with the CGMS information.

Alternatively, in the case where the information of "copying disabled, or copy never" is described as CGMS information, only a warning message such as "this program is copyright reserved, and copying or recording is prohibited" may be transferred from mutual authentication/key exchange & encryption information I/F control section 3120 to information recording and reproducing section 3000, so that any recording cannot be made, except for recording of the above warning.

The above CGMS information (2-bit flag indicative of copy limitation type or warning message for copyright reserved) can be written into card specific ID & key information recording region (RAM) 103 of audio card (memory card) 100 shown in (a) of FIG. 3, for example.

Alternatively, in optical disc 170 shown in (a) of FIG. 4, for example, the above CGMS information (2-bit flag indicative of copy limitation type or warning message for copyright reserved) can be written into the rewritable data zone of read-in area 1800 or into management information recording region 130 shown in (d) of FIG. 4.

ID is mutually checked.

For example, CPU/MPU 101 of card 100 shown in (a) of FIG. 3 reads the ID being specific to the apparatus shown in FIG. 9 via information recording and reproducing section 3000 (this ID is written in advance in a ROM (not shown) in information recording and reproducing section 3000). By so doing, it possible to check whether or not the apparatus normally matches its identity (card 100).

Similarly, system control section 3020 shown in FIG. 9 reads the ID being specific to card 100 shown in (a) of FIG. 3 via information recording and reproducing section 300, thereby making it possible to check whether or not the card normally matches its identity (apparatus of FIG. 9).

In this way, mutual authentication between card 100 and the apparatus shown in FIG. 9 is performed (step ST10 in FIG. 10).

If the above mutual authentication fails, although not shown in FIG. 10, the subsequent processing is canceled, and no information is recorded into or reproduced from card 100.

When the above authentication is done successfully (or when the authentication is OK), a common encryption key (or common encryption/decryption key), which is common to audio card 100 and encryption/decryption processing section 30110, is generated based on random

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for the decryption.

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Then, the encrypted digital information is transferred to card 100, and is recorded into a predetermined portion of data region 113 of card 100 (when recording is performed at step ST16).

5 Here, in the case where the information to be copyright reserved is recorded in card 100, the CGMS-D information is transferred and recorded simultaneously.

On the other hand, when the encrypted information is reproduced, data (voice/audio information or
10 picture/image information) being subjected to the encrypting conversion in encrypting units as well as data of encrypting free ADTS header 2710 portion and the region "g" portion are transferred from card 100 to encryption/decryption processing section 3010 via
15 information recording and reproducing section 3000 (when reproduction is performed at step ST16).

Then, the transferred, encrypting-converted data are decrypted by decryption processing section 3130 (step ST18), and is transferred to output data/control
20 information transfer destination switching section (data/command bus line) 3220.

The above-mentioned encrypting-converted data contains the CGMS-D information if it is copyright reserved.

25 Hereinafter, an example of reproduction processing will be described in more detail.

In the case of reproducing information recorded in

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audio card 100 with the copy protection function,
information recording and reproducing section 3000
reads the information in program chain set information
recording region 140 shown in (e) of FIG. 3. After at
5 least part of the read information has been stored in
the memory section (RAM) provided in system control
section 3020, an audio information file to be
reproduced is searched using the information
temporarily stored in the memory section.

10 Before reproducing the audio information file,
information of CGMS-D related to the audio information
is read. Then, it is determined by system control
section 3020 whether the read information is directly
transferred to output data/control information transfer
15 destination switching section 3020 or the read
information is transferred to this section 3020 via
encryption/decryption processing section 3010. Then,
either one of the transfer routes is selected according
to the result of determination done by system control
20 section 3020.

In the case where the encrypted information
is transferred from information recording and
reproducing section 3000, the processing of mutual
authentication/key exchange is performed at steps ST10
25 to ST12 of FIG. 10. Then, a common encryption key is
held by both of encryption/decryption processing
section 3010 and audio card 100.

The encrypted information inputted to decryption (decode) processing section 3130 via mutual authentication/key exchange & encryption information I/F control section 3120 has a structure as shown in (e) of FIG. 8.

This encrypted information is decrypted (decoded) by decryption processing section 3130 in encrypting units based on the common encryption key, and the decrypted plain information is re-arranged in encrypting units so as to retrieve its original data arrangement.

The (decrypted, plain) digital information transferred from output data/control information transfer destination switching section (data/command bus line) 3220 may be processed as follows.

(31) Audio information is decoded by audio decoder 3220, and is returned to a linear PCM signal. Then, the linear PCM signal is temporarily stored in audio buffer 3410.

(32) Text information is subjected to character-conversion (conversion of codes to characters) by character generator 3340, and the converted characters are temporarily stored as image information in text line buffer 3420.

(33) Still image information, compressed by JPEG or MPEG (I picture) or the like, is converted into bit map information in image decoder 3330, and the

converted bit map information is temporarily stored in page buffer 3430.

(34) Still image information in bit map format temporarily stored in page buffer 3430 is combined, as
5 needed, with text information image temporarily stored in line buffer 3420 by means of video processor section 3370, so that one combined image is generated.

Thus obtained combined image is properly displayed at image display section 3710 such as color liquid
10 crystal panel.

On the other hand, audio information temporarily stored in audio buffer 3410 is transferred by each frame to D/A converter (DAC) 3360, and the transferred audio information is converted into an analog signal.
15 Then, the converted analog signal is supplied to external output terminal 3720 to which connected is an amplifier for driving a speaker or the like.

Incidentally, display timing at image display section 3710 for text or still image information during reproduction of audio information can be controlled in
20 synchronism with the reproduced audio frame number.

At system control section 3020 shown in FIG. 9, for example, a value obtained by dividing "total number of frames" of music number # β shown in (b) of FIG. 6 by
25 "number of still images displayed during reproduction" is set as "number of audio frames to be reproduced per still image".

The audio frame number being reproduced (or the accumulated number of audio frames) is always monitored at system control section 3020. When the reproduced audio frame number reaches its predetermined value, the still image information in page buffer 3430 to be transferred to image display section (color liquid crystal display) 3710 is changed.

Any of the aforementioned "combining music" and "dividing music" by referring to FIG. 2 can be mainly done by system control section 3020 shown in FIG. 9. The changed management information (CI# or AOBI#) is transferred to information recording and reproducing section 3000 via output data/control information transfer destination switching section (data/command bus line) 3220.

As a result, the information in management information recording region 130 shown in (d) of FIG. 3 is rewritten. In addition, during "dividing music" processing, the information (audio data corresponding to AOBI#3, AOBI#5, AOBI#6 in the example of (c) and (d) of FIG. 2) contained in audio object recording region 131 is changed (this is the processing of dividing the audio information file from AOBI#3 into AOBI#5 and AOBI#6).

When optical disc 170 shown in FIG. 4 is employed for information recording and reproducing section 3000 shown in FIG. 9, unlike memory card 100, disc 170 does

not have control CPU/MPU 101. In this case, the
aforementioned processing of FIG. 10 can be performed
at the side of mutual authentication/key exchange &
encryption information I/F control section 3120.

5 More specifically, when disc 170 is inserted into
information recording and reproducing section 3000,
mutual authentication/key exchange & encryption
information I/F control section 3120 inquires disc 170
for the disc specific ID.

10 Then, disc 170 answers its own ID (disc
manufacturer, product name, lot number, serial number
or the like) recorded in read-in area 1800, etc. shown
in (b) of FIG. 4.

15 On the other hand, the mutual authentication/key
exchange & encryption information I/F control section
3120 has an internal ROM (not shown) containing an ID
table for the available medium(s). This section 3120
checks whether or not the internal ID table contains
available medium information corresponding to the disc
20 specific ID answered from disc 170. If the internal ID
table contains information that matches the disc
specific ID , then mutual authentication is established
between disc 170 and the apparatus shown in FIG. 9.

25 More specifically, when optical disc 170 is loaded
(by the user) to information recording and reproducing
section 3000 shown in FIG. 9, mutual authentication/key
exchange & encryption information I/F control section

3120 reads the ID of disc from, for example, read-in area 1800 of optical disc 170, and checks the counterpart by referring to its own ID table, etc. of the apparatus shown in FIG. 9 (step ST10 of FIG. 10).

5 The subsequent processing (steps ST12 to ST18 of FIG. 10) may be similar to a case wherein memory card 100 is employed, except for the fact that the subsequent processing is executed on the side of mutual authentication/key exchange & encryption information I/F control section 3120 shown in FIG. 9.

10 FIG. 11 is a flow chart illustrating the procedure for recording audio information with image information in the audio card shown in FIG. 3 (or in the optical disc shown in FIG. 4). This procedure can be executed by system control section 3020 shown in FIG. 9, for example.

15 First, in addition to a recording region for the audio information (audio object AOB) and image information (image object IOB/IMG), audio card 100 shown in FIG. 3 (or optical disc 170 shown in FIG. 4) is provided as an information recording medium having the management information (AOBI shown in (c) of FIG. 6 which can contain image pointer information IPI, or CI shown in (b) of FIG. 7 which can contain IPI) for specifying image information (image object IOB/IMG) to be displayed during reproduction (step ST100).

25 A still image that can be displayed at the same

time as reproduction of audio information (AOB) or the like is employed as the image information (IOB/IMG).

Next, a management unit (cell C, audio object AOB, or track TK) indicative of the reproduction range in AOB is defined. The management information (cell information CI, audio object information AOBI, or track information TKI) based on the management unit is recorded in the management information recording region (AOBSI recording region 141 shown in (e) of FIG. 3, (e) of FIG. 4, or (c) of FIG. 6; or CI recording region 161 shown in (g) of FIG. 3, (g) of FIG. 4, or (b) of FIG. 7, etc.) (step ST102).

In this step, in the case where the above AOB represents a music number, the management unit (cell C/AOB/track TK) indicative of the reproduction range in music number size or audio information (AOB) smaller in size than the music number is defined, in order to simplify the management information change processing before and after combining music, for example.

Next, the information (image pointer information IPI) for specifying the IOB to be displayed while the AOB in the management unit is reproduced is recorded in the management information (CI/AOBI/TKI) based on the management unit (step ST104).

FIG. 12 is a flow chart illustrating how the still image corresponding to the music number is displayed, when audio information is reproduced by music number

from the medium (audio card shown in FIG. 3 or optical disc shown in FIG. 4) having information recorded according to the steps of FIG. 11. This processing can also be executed by system control section 3020 shown in FIG. 9.

First, the size of the reproduction range indicated by the management unit (C/AOB/TK) is compared with that of the corresponding music number. When these sizes coincide with each other, an image object (IOB/IMG) of the still image specified by image pointer information IPI contained in the management information (CI/AOBI/TKI) is displayed at the same time as reproduction of that music (step ST200).

Here, in the case where one music number (e.g., music number $\# \beta$ shown in (b) of FIG. 6) is composed of a plurality of management units (C/AOB/TK), a plurality of management information (CI/AOBI/TKI) exist in the music number (music number $\# \beta$).

In this case, an image object (IOB/IMG) of the still image, specified by IPI#2 shown in (c) of FIG. 6, or specified in the management information (CI/AOBI/TKI; for example, AOBI#2 in (c) of FIG. 6) corresponding to the management unit (C/AOB/TK) to be reproduced first in the music number ($\# \beta$), is displayed while the music number ($\# \beta$) is reproduced (step ST202).

FIG. 13 is a flow chart illustrating the procedure for edit processing when two music numbers of the audio

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Next, when the number (4 in the example of (b) of FIG. 1) of still images (IMG_01.IOB to IMG_04.IOB in (b) of FIG. 1) specified by music number $\# \alpha$ and music number $\# \beta$ is equal to or less than a predetermined number (for example, 20), the still image specifying information (image pointer information IPI) on the later reproduced music number $\# \beta$ is moved to management information (CI $\# \alpha$, AOBI $\# \alpha$ or TK $\# \alpha$; or AOBI $\# 1$ exemplified in (c) of FIG. 1) on music number $\# \alpha$ to be reproduced first (step ST302).

On the other hand, when the number of the still images specified by music number $\# \alpha$ and music number $\# \beta$ exceeds the predetermined number (20), (for example, when a total number of the images reaches 25, 15 of which is specified by music number $\# \alpha$ and 10 of which is specified by music number $\# \beta$ in (a) of FIG. 2), the predetermined number (20) of still images are automatically selected from among the still images (IMG_01.IOB to IMG_15.IOB in $\# \alpha$ + IMG_01.IOB to IMG_10.IOB in $\# \beta$; not shown) specified by music number $\# \alpha$ and music number $\# \beta$ (this automatic selection method will be described later by referring to FIG. 14).

Then, the specifying information (image pointer information IPI for 20 images; or IPI $\# 1$ ' exemplified in (b) of FIG. 2) concerning the selected still image is rewritten in the management information

(CI# α /AOBI# α /TKI# α) concerning music number # α ,
and the specifying information (image pointer
information IPI for 5 images; or IPI#2' exemplified in
(b) of FIG. 2) concerning the deselected (rejected)
5 still image (25 - 20 = 5 images shown in the above
example) is rewritten in the management information
(CI# β /AOBI# β /TKI# β) concerning music number # β
(step ST304).

In this way, the rejected image(s) deselected from
10 the images targeted for display and the management
information/specifying information are not actually
erased but (as long as the user erases them
intentionally) they remain without being displayed.
Thus, edit processing for restoring the remaining
15 rejected images to a target of display can be made as
required.

In the case where music number # γ combined via
the above processing is reproduced, the still
image (IOB/IMG) specified in the management information
20 (CI# α /AOBI# α /TKI# α) concerning music number # α
(or specified by the IPI pointer) is displayed at
the same time as reproduction of music number # γ
(step ST306).

After music number # α and music number # β have
25 been combined to form music number # γ , in the case
where an attempt is made to display a rejected image(s)
deselected from the display targets during reproduction

of music number γ , audio card 100 shown in FIG. 3
(or optical disc 170 shown in FIG. 4) is set to
an apparatus having its predetermined edit function
(for instance, an advanced recording/reproducing
5 apparatus for audio card or optical disc, or a personal
computer installed with a necessary interface and
edit program). By means of this edit function, it is
possible to replace or exchange the management
information ($CI\#\alpha/AOBI\#\alpha/TKI\#\alpha$) concerning
10 music number α with the management information
($CI\#\beta/AOBI\#\beta/TKI\#\beta$) concerning music number β
(step ST308).

Then, the image pointer information ($IPI\#2'$ shown
in (b) of FIG. 2) for specifying the rejected image(s)
15 becomes the target information for display, so that the
rejected image(s) can be displayed during reproduction
of music number γ .

FIG. 14 is a flow chart illustrating a specific
example of "automatic selection of still image" to be
20 performed in step ST304 shown in FIG. 13.

Here, assume that 15 still images (IOB/IMG) for
music number α (15 pointers $\alpha IP\#1$ to $\#15$ for
specifying the still images) are present; and 10 still
images for music number β (10 pointers $\beta IP\#1$ to $\#10$
25 for specifying the still images) are present.

Under this assumption, 20 or less still images
(here 20 still images) can be automatically selected

from more than 20 still images (here 25 still images)
by using any of the methods below (step ST3040).

- 5 (1) randomly shuffling the numbers (#1 to #15) of
the pointers (α IP#1 to #15) of still images (IOB/IMG)
of music number # α and the numbers (# to #10) of
pointers (β IP#1 to #10) of still images (IOB/IMG) of
music number # β to list them randomly (as a result,
a total of 25 pointer numbers is present); and
selecting 20 or less pointer numbers (γ IP#1 to #20)
10 (here 20 pointers) from the beginning (or from the
end); or
- (2) sequentially arranging the odd pointer numbers
(α IP#1, #3, ...) of still images (IOB/IMG) of music
number # α and the even pointer numbers (β IP#2,
15 #4, ...) of still images (IOB/IMG) of music number # β
to list in ascending order; and selecting 20 or less
pointer numbers (γ IP#1 to #20) (here 20 pointers) from
the beginning (or from the end); or
- (3) collectively arranging (or listing) the
20 pointer numbers of still images (IOB/IMG) of music
number # α and music number # β in ascending order
(for example, α #1, β #1, α #2, β #2, ...), and selecting
20 or less (20) pointer numbers (γ IP#1 to #20) (here 20
pointers) from the beginning (or from the end).
- 25 Incidentally, the still image(s) deselected from
the automatic selection of step ST3040 is automatically
handled as a rejected image(s).

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FIG. 15 is a flow chart illustrating the procedure for edit processing when one music number of the audio information with image information recorded in the audio card shown in FIG. 3 (or optical disc shown in FIG. 4) is divided into two sections. This procedure can be executed by system control section 3020 shown in FIG. 9, for example.

Now assume a case wherein, while music number # θ recorded in card 100 is reproduced by the apparatus shown in FIG. 9, the user desires to divide music number # θ into two sections.

In this case, the user may depress a reproduction pause button (not shown, but provided on a panel of the apparatus shown in FIG. 9) at the time when he or she wishes to divide the music number # θ . Then the user can select the division of music or "dividing music" by the manipulation of an edition dial (not shown, but provided on the panel of the apparatus shown in FIG. 9).

Thereafter, system control section 3020 shown in FIG. 9 divides the management unit ($C\#\theta/AOB\#\theta/TK\#\theta$) of music number # θ into the management unit ($C\#\iota/AOB\#\iota/TK\#\iota$) of music number # ι and the management unit ($C\#\kappa/AOB\#\kappa/TK\#\kappa$) of music number # κ in correspondence with the portion of dividing boundary of music number # θ in the reproduction pause state. Then, the management information ($CI\#\iota/AOBI\#\iota/TKI\#\iota$

and $CI\# \kappa / AOBI\# \kappa / TKI\# \kappa$) based on the respective management units is newly set (step ST400).

Next, the still image specifying information (IPI#1" shown in (c) of FIG. 2) in the management information ($CI\# \theta / AOBI\# \theta / TKI\# \theta$) of music number # θ is copied as the still image specifying information (for example, IPI#1" shown in (d) of FIG. 2) in the management information ($CI\# \iota / AOBI\# \iota / TKI\# \iota$ and $CI\# \kappa / AOBI\# \kappa / TKI\# \kappa$) corresponding to music number # ι and music number # κ (step ST402).

IPI#1" for specifying the display still image of music number # θ is originally within a predetermined number (here "20"). Thus, even if this (IPI#1" within the predetermined number "20") is entirely copied to music number # ι and music number # κ , the number of still images targeted to be displayed by music number # ι and music number # κ is within 20.

As a result, the still image (IOB/IMG) to be displayed when music number # ι or music number # κ is reproduced is the same as the still image (IOB/IMG) displayed when music number # θ before division is reproduced (step ST404).

As exemplified in (c) of FIG. 2, when music number # θ before division has plural pieces of rejected image information, the information (IPI#2', IPI#3', and IPI#4) for specifying the rejected images is properly distributed to the divided music number # ι and music

number #κ (refer to (d) of FIG. 2).

FIG. 16 is a view illustrating an example of a reproduction relationship (the arrows shown in the figure) between a plurality of music numbers stored in the information storage medium shown in FIG. 3 or FIG. 4 and text (characters, signs, graphics and/or marks) accompanied with these music numbers.

In FIG. 16, there is shown an example of how text information displayed simultaneously during music reproduction is managed, wherein audio object information AOBI# and image pointer information IPI# shown in FIG. 6 are respectively replaced with text object information TOBI# and text pointer information TPI#.

FIG. 19 is a view illustrating another example of a reproduction relationship (the arrows in the figure) between a plurality of music numbers stored in the information storage medium shown in FIG. 3 or FIG. 4 and text (characters, signs, graphics and/or marks) accompanied with these music numbers.

FIG. 19 shows another example of how text information displayed simultaneously during music reproduction is managed, wherein image pointer information IPI# shown in FIG. 6 is replaced with text pointer information TPI#.

FIG. 17 is a view illustrating still another example of a reproduction relationship (the arrows

shown in the figure) between a plurality of music numbers stored in the information storage medium shown in FIG. 3 or FIG. 4 and text (characters, signs, graphics, and/or marks) accompanied with these music numbers.

FIG. 17 shows still another example of how text information displayed simultaneously during music reproduction is managed, wherein image object information IOBI# shown in FIG. 7 is replaced with text object information TOBI#.

FIG. 18 is a view illustrating a reproduction relationship (dashed line arrows shown in the figure) between a plurality of music numbers and still images accompanied with these music numbers, provided that the cell information (CI#) shown in FIG. 6 is reread to the track search pointer (DPL_TK_SRP#); the audio object information (AOBI#) shown in FIG. 6 is reread to track information (TKI#); and the image pointer information (IPI#) shown in FIG. 6 is reread to the track information search pointer (TKI_IOB_SRP) for the image object.

The information reproduction relationship described with reference to FIG. 6 or FIG. 7 can be applied to FIG. 18 by rereading the following terms (replacement on interpretation of terms):

- * PGC set information → play list manager PLM;
- * Original PGC → default play list DPL;

* Individual user defined PGC - individual play
list PL;

* Cell information CI → track search pointer
DPL_TK_SRP of the default play list;

5 * Audio object information AOBI → track
information TKI;

* Cell information CI → track information TKI;

* Image pointer information IPI → track
information image object search pointer TKI_IOB_SRP;

10 and

* Time map information TMI → time search table
TMSRT.

In the configuration shown in FIG. 18, if the
playing time of music number #B is long, the AOB file
15 of such long music number #B may be automatically
divided by given specific time intervals, and track
information TKI (corresponding to AOBI or CI) may be
assigned to each divided AOB file.

In the above case, the divided AOB file number is
20 made coincident with the assigned TKI number.

Only the head TKI (or the leading TKI) of each
music number is specified from individual play list PL
defined by the user, not from default play list DPL.
In this case, the still image(s) to be displayed in
25 unit of the music number is(are) specified by the head
TKI of each music number.

In the example shown in FIG. 18, an unrecorded

area or unused area is provided for the contents of default play list DPL or those of track manager TKM (management information).

5 When an unrecorded area (unused area) can thus be set in management information, even if part of the management information is deleted by editing or the like, the handling of the management information can be simplified because the other part of the management information can be maintained intact.

10 Further, since the size of each TKM (management information) including the unused area is fixed to, for example, 1536 bytes, the management of the recording position (address) of each TKM (management information) can be simplified.

15 In view of this fact, the buffer memory size of the reproduction apparatus side required for the management information (or the size of a buffer (not shown) incorporated in, for example, information recording and reproducing section 3000 of the apparatus shown in FIG. 9) can be saved significantly.

Advantages obtained by preferred embodiments of the present invention described hereinbefore can be summarized as follows.

25 1. According to an embodiment of the present invention, edit processing such as combining and/or dividing music can be performed simply and quickly for audio information with still image (or audio

information that can be reproduced together with still image(s)/still picture(s)) without materially changing management information.

2. Still image(s) to be displayed when audio
5 information is reproduced in unit of music number can be easily set during edit processing such as combining and/or dividing music.

3. Even after combining music, the reproduction
10 range of music before being combined is left as "management unit (cell/AOB/track)" indicative of the reproduction range in audio information (AOB), and the management information (CI/AOBI/TKI) concerning the management unit is recorded as management information
15 on the information storage medium. Thus, changes in the management information before and after combining music become small, and control during editing is simplified.

4. When one music number is composed of a
20 plurality of "management units (cell/AOB/track)" by combining music or the like, specifying information, concerning the still image information described in the management information (CI/AOBI/TKI) which is related to the management unit to be reproduced first in the music, is indicative of the still image information
25 displayed when the entire music is reproduced, and thus, the memory size of the reproduction apparatus can be reduced.

At this time, when the specifying information for still image information displayed during reproduction in unit of music number has been recorded in management information concerning the management unit reproduced in the latter half of the music, then the management information concerning all management units configuring the music is temporarily stored in a memory of the reproduction apparatus before reproducing the music.

5. The information for specifying the still image information (IOB) out of the display target range after combining music is recorded in management information (CI/AOBI/TKI) concerning management unit (cell/AOB/track) displayed in second and subsequent part of the same music number. Then, (by use of a highly advanced machine, for example,) a user can select and change later the still image information (IOB) targeted for display by music number (or in unit of music number).

6. After dividing music, the specifying information for the still image information (IOB) before division is entirely copied and stored, so that the user can feel comfort that the still image information displayable after division is maintained without being altered.

Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to

the specific details and representative embodiments shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalents.

WHAT IS CLAIMED IS:

1. An information storage medium comprising:
a recording region for audio information and image
information;

5 a first reproduction unit for reproducing said
audio information; and

a second reproduction unit having fineness equal
to or less than the first reproduction unit,

10 wherein said first reproduction unit is composed
of one or more said second reproduction units,

management information concerning said second
reproduction unit is recorded in said medium, and

15 a reproduction relationship between said audio
information and said image information is described in
said management information.

2. The medium according to claim 1, wherein at
least one item of said management information, in which
the reproduction relationship between said audio
information and said image information is described,
20 includes information for specifying image information
to be displayed when said audio information is
reproduced in said first reproduction unit which
includes said second reproduction unit.

25 3. The medium according to claim 1, further
comprising an area for storing identification
information specific to said information storage
medium.

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4. The medium according claim 1, wherein, in a case where information recorded in the information storage medium is encrypted, said medium further comprises an area for storing information required for decrypting the encrypted information.

5. The medium according to claim 1, further comprising an area in which described is a process of performing mutual authentication between said medium and an apparatus for recording information in the medium or reproducing information from the medium.

~~6.~~ An information storage medium comprising:
a recording region for audio information and image information;

a first reproduction unit for reproducing said audio information; and

a second reproduction unit having fineness equal to or less than the first reproduction unit,

wherein said first reproduction unit is composed of one or more said second reproduction units,

management information concerning said second reproduction unit is recorded in said medium,

a reproduction relationship between said audio information and said image information is described in said management information,

said audio information includes a predetermined header and digital audio information compressed according to a predetermined method,

said predetermined header is stored in an area not encrypted, and

said compressed digital audio information is stored in an encrypted area in a predetermined encrypting unit.

7. An information storage medium comprising:
a recording region for audio information and text information;

a first reproduction unit for reproducing said audio information; and

a second reproduction unit having fineness equal to or less than the first reproduction unit,

wherein said first reproduction unit is composed of one or more said second reproduction units,

management information concerning said second reproduction unit is recorded in said medium, and

a reproduction relationship between said audio information and said text information is described in said management information.

8. The medium according to claim 7, wherein at least one item of said management information, in which the reproduction relationship between said audio information and said text information is described, includes information for specifying text information to be displayed when said audio information is reproduced in said first reproduction unit which includes said second reproduction unit.

9. A method for reproducing audio information with image from an information storage medium which has a recording region for audio information and image information; a first reproduction unit for reproducing said audio information; and a second reproduction unit having fineness equal to or less than the first reproduction unit, wherein said first reproduction unit is composed of one or more said second reproduction units, management information concerning said second reproduction unit is recorded in said medium, and a reproduction relationship between said audio information and said image information is described in said management information, said method comprising:

a step for determining, utilizing said management information, the image information to be displayed when the audio information is reproduced in said first reproduction unit.

10. The method according to claim 9, further comprising:

a step, utilizing information recorded in said management information concerning said second reproduction unit to be reproduced first in said first reproduction unit, for determining image information to be displayed when said audio information is reproduced in said first reproduction unit.

11. A method for reproducing audio information with text information from an information storage

medium which has a recording region for audio
information and text information; a first reproduction
unit for reproducing said audio information; and a
second reproduction unit having fineness equal to or
5 less than the first reproduction unit, wherein said
first reproduction unit is composed of one or more said
second reproduction units, management information
concerning said second reproduction unit is recorded in
said medium, and a reproduction relationship between
10 said audio information and said text information is
described in said management information, said method
comprising:

a step for determining, utilizing said management
information, the text information to be displayed when
15 the audio information is reproduced in said first
reproduction unit.

12. A method for editing audio information with
a still image using an information storage medium in
which audio information and still image information are
20 recorded, and management information indicative of
a reproduction relationship between said audio
information and said still image information is
recorded, wherein said medium comprises a first
reproduction unit for reproducing said audio
25 information, first management information specifying
still image information to be reproduced simultaneously
when first audio information is reproduced in said

first reproduction unit, and second management
information specifying still image information
reproduced simultaneously when second audio information
different from said first audio information is
5 reproduced in said first reproduction unit, said method
comprising:

combining said first audio information and said
second audio information with each other to produce
third audio information which newly forms said first
10 reproduction unit;

recording third management information
corresponding to said third audio information on said
information storage medium; and

including, in still image information specified in
15 said third management information, all or at least part
of still image information specified in said first
management information, and including therein all or at
least part of still image information specified in said
second management information.

20 13. The method according to claim 12, wherein,
in a case where said first audio information is
reproduced earlier than said second audio information
in said third audio information, a recording place for
said third management information is utilized to be
25 compatible with a recording place for said first
management information;

in a case where a summation of the still image

09062217 091400

information specified in said first management
information and the still image information specified
in said second management information exceeds a
predetermined value, a total number of the still image
5 information specified in said third management
information is reduced to the predetermined value so
that a reduced number of the still image information
remains, and information specifying the reduced number
of remaining still image information is recorded at
10 a portion corresponding to the first management
information of said third management information; and
information specifying still image information
other than the still image information specified in
said third management information is recorded at a
15 portion corresponding to the second management
information of said third management information.

14. A method for editing audio information with
a text using an information storage medium in which
audio information and text information are recorded,
20 and management information indicative of a reproduction
relationship between said audio information and said
text information is recorded, wherein said medium
comprises a first reproduction unit for reproducing
said audio information, first management information
25 specifying text information to be reproduced
simultaneously when first audio information is
reproduced in said first reproduction unit, and second

management information specifying text information reproduced simultaneously when second audio information different from said first audio information is reproduced in said first reproduction unit, said method comprising:

combining said first audio information and said second audio information with each other to produce third audio information which newly forms said first reproduction unit;

recording third management information corresponding to said third audio information on said information storage medium; and

including, in text information specified in said third management information, all or at least part of text information specified in said first management information, and including therein all or at least part of text information specified in said second management information.

~~15.~~ A method for editing audio information with a still image using an information storage medium in which first audio information and still image information are recorded, and a first management information indicative of a reproduction relationship between said first audio information and said still image information is recorded, wherein said medium comprises a first reproduction unit for reproducing the first audio information, and said first management

information records specifying information for
specifying the still image information to be reproduced
simultaneously when the first audio information is
reproduced in said first reproduction unit, said method
5 comprising:

dividing said first audio information into second
audio information reproduced in said first reproduction
unit and third audio information reproduced in said
first reproduction unit;

10 setting second management corresponding to said
second audio information and third management
information corresponding to said third audio
information; and

recording said specifying information recorded in
15 said first management information in said second
management information and said third management
information.

16. A method for editing audio information with
a text using an information storage medium in which
20 first audio information and text information are
recorded, and a first management information indicative
of a reproduction relationship between said first audio
information and said text information is recorded,
wherein said medium comprises a first reproduction unit
25 for reproducing the first audio information, and said
first management information records specifying
information for specifying the text information to be

wherein a reproduction relationship between said

audio information and said image information is described in said management information.

18. A data structure used for an information storage medium having a recording region for audio information and image information, said data structure comprising:

a first reproduction unit for reproducing said audio information, and a second reproduction unit having fineness equal to or less than the first reproduction unit, said first reproduction unit being composed of one or more said second reproduction units; and

management information concerning said second reproduction unit,

wherein a reproduction relationship between said audio information and said image information is described in said management information,

said audio information includes a predetermined header and digital audio information compressed according to a predetermined method,

said predetermined header is stored in an area not encrypted, and

said compressed digital audio information is stored in an encrypted area in a predetermined encrypting unit.

19. A data structure used for an information storage medium having a recording region for audio

information and text information, said data structure comprising:

a first reproduction unit for reproducing said audio information, and a second reproduction unit having fineness equal to or less than the first reproduction unit, said first reproduction unit being composed of one or more said second reproduction units; and

management information concerning said second
10 reproduction unit,

wherein a reproduction relationship between said audio information and said text information is described in said management information.

ABSTRACT OF THE DISCLOSURE

In a memory card having editable audio information and image information recorded therein, a music unit for audio reproduction and a cell as the reproduction unit of less than the music unit are defined. In the memory card, cell information CI having a reproduction relationship between a music number and image information is recorded. In a case where audio information is reproduced in unit of music number # β including cell information CI#2 to CI#4, cell information CI#2 contains pointer information IPI#2 for specifying image information IMG_02.IOB to IMG_03.IOB to be displayed. In this manner, there is provided guideline information as to how the still image corresponding to the edited music is displayed after edit processing has been performed for recorded audio information (music).

09632347 094400
004750 773960

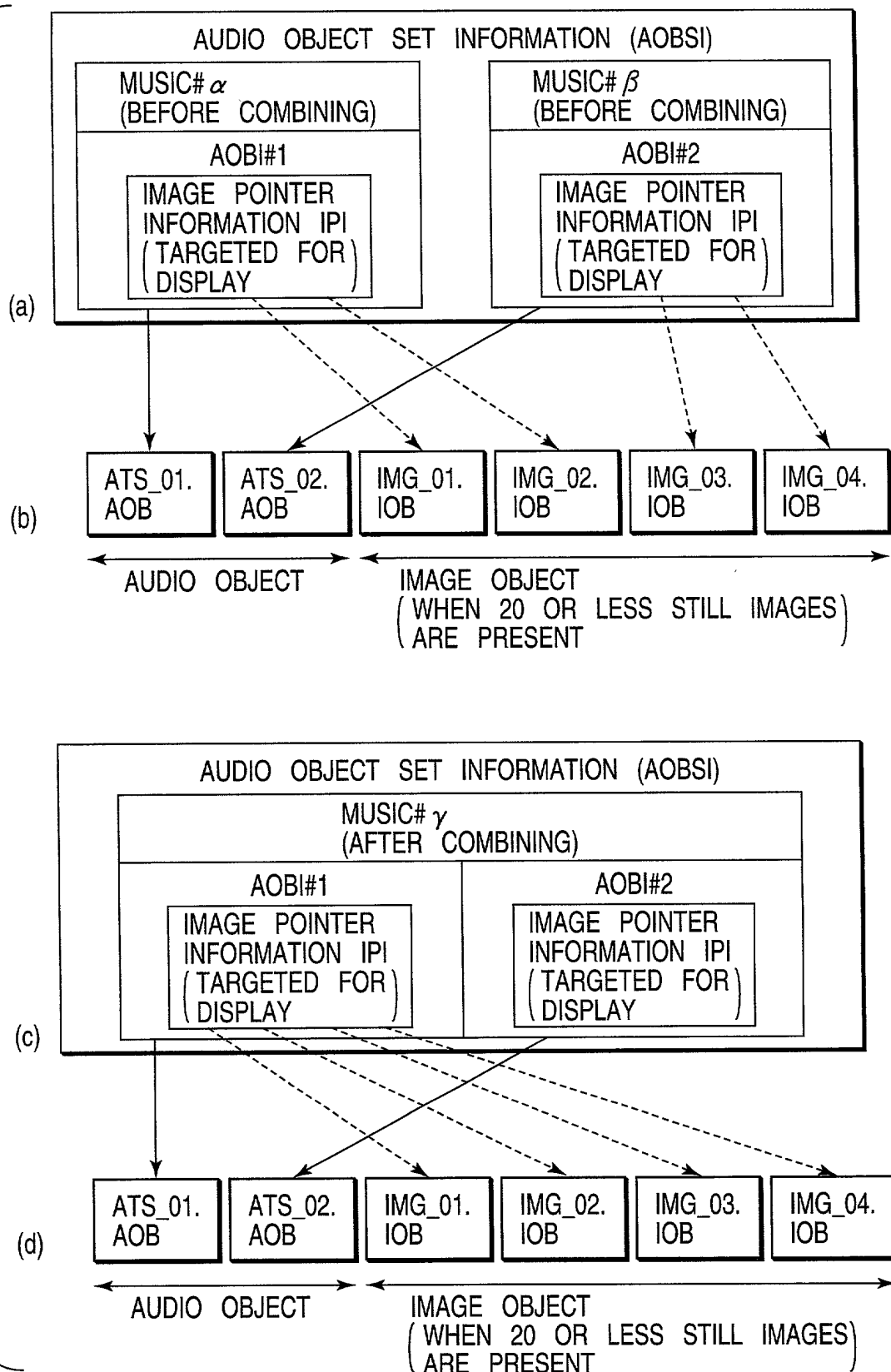


FIG. 1

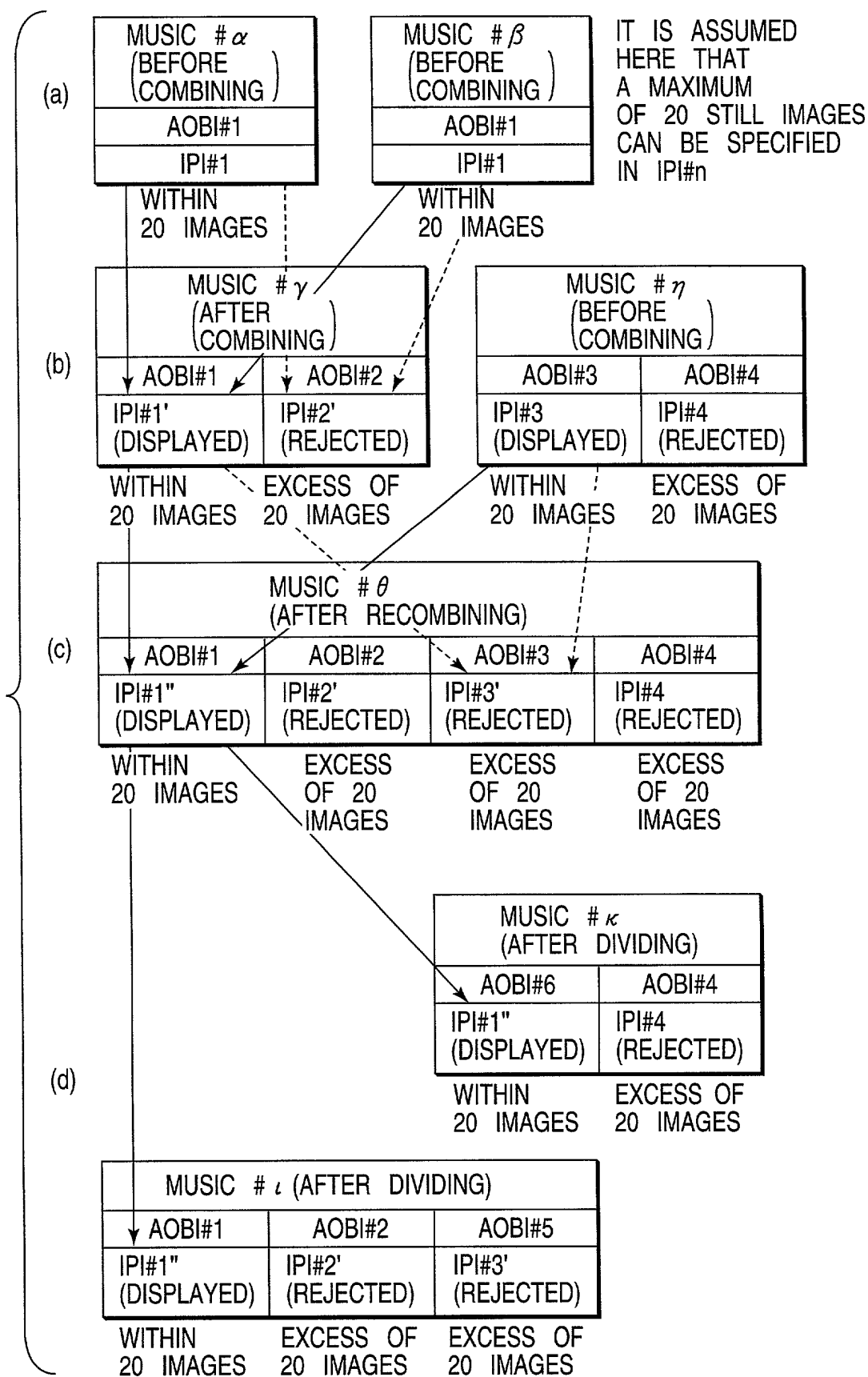


FIG. 2

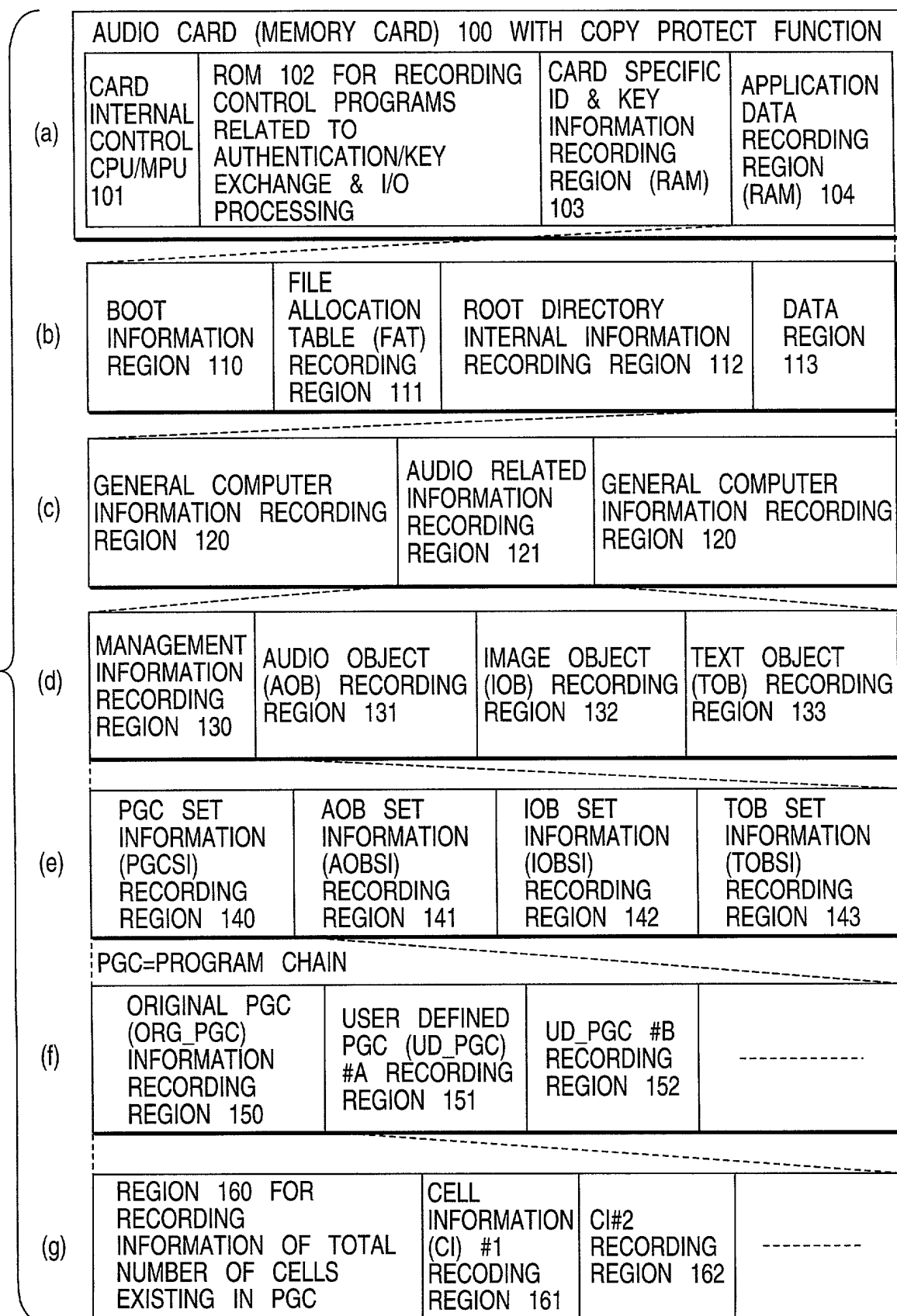


FIG. 3

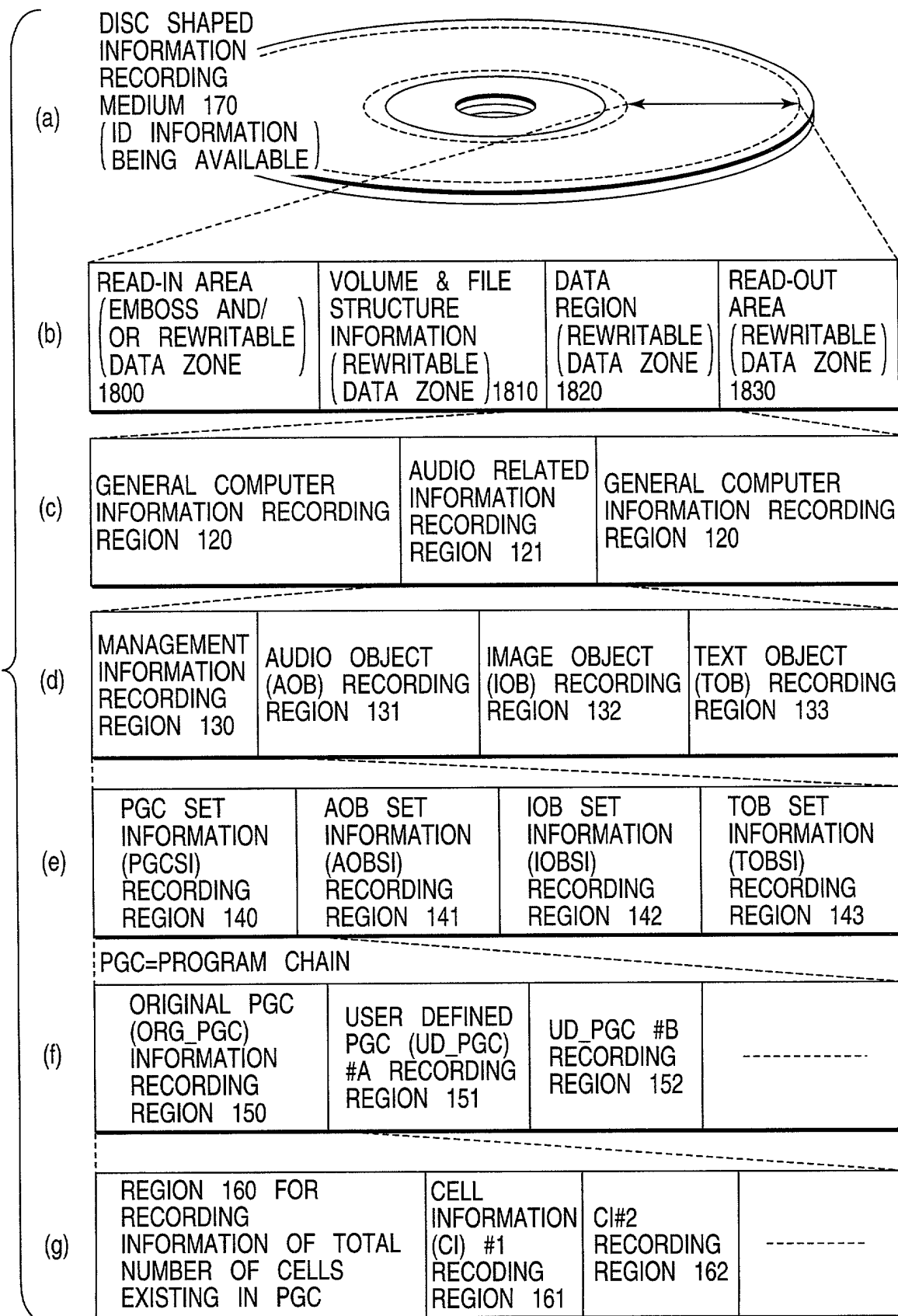


FIG. 4

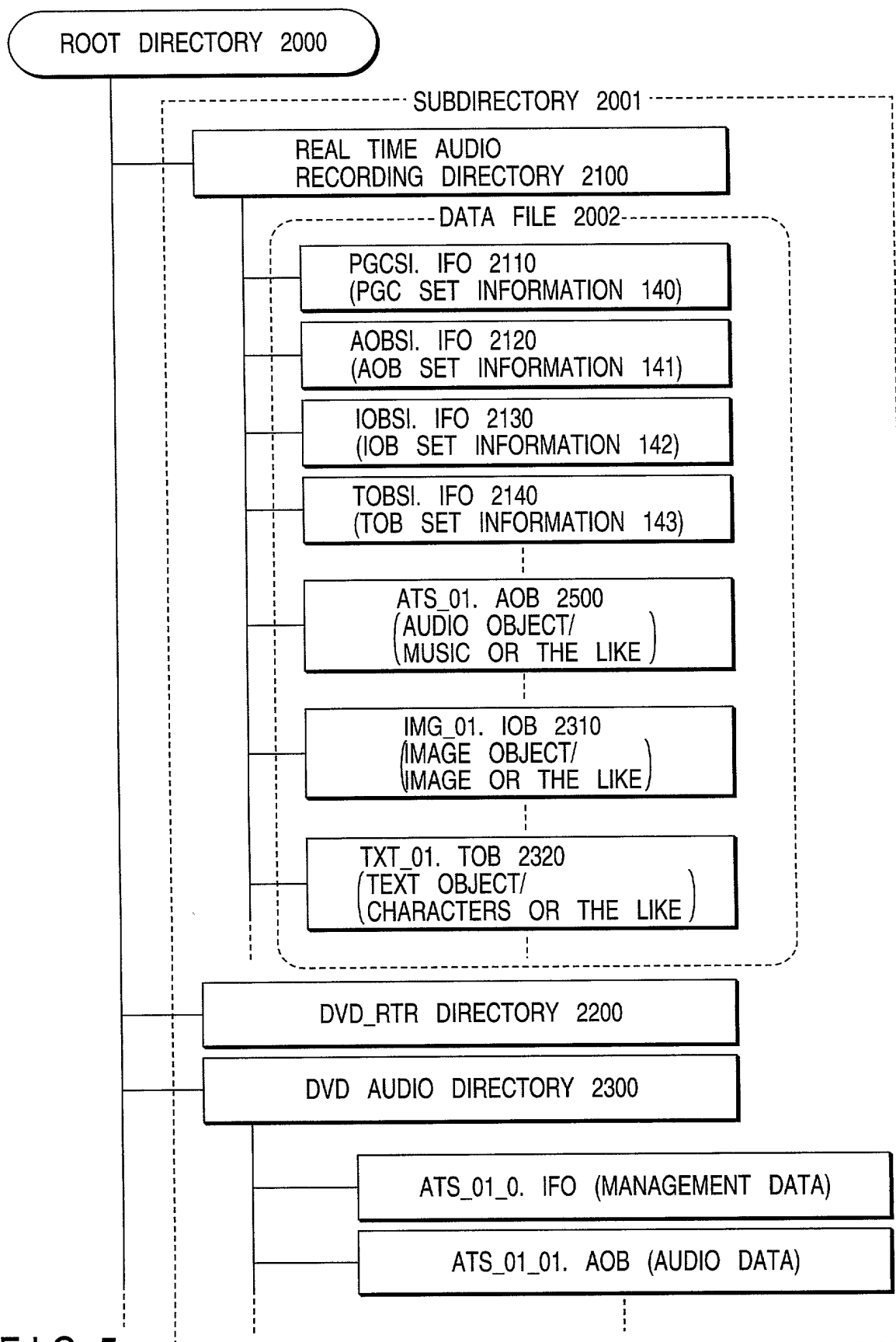


FIG. 5

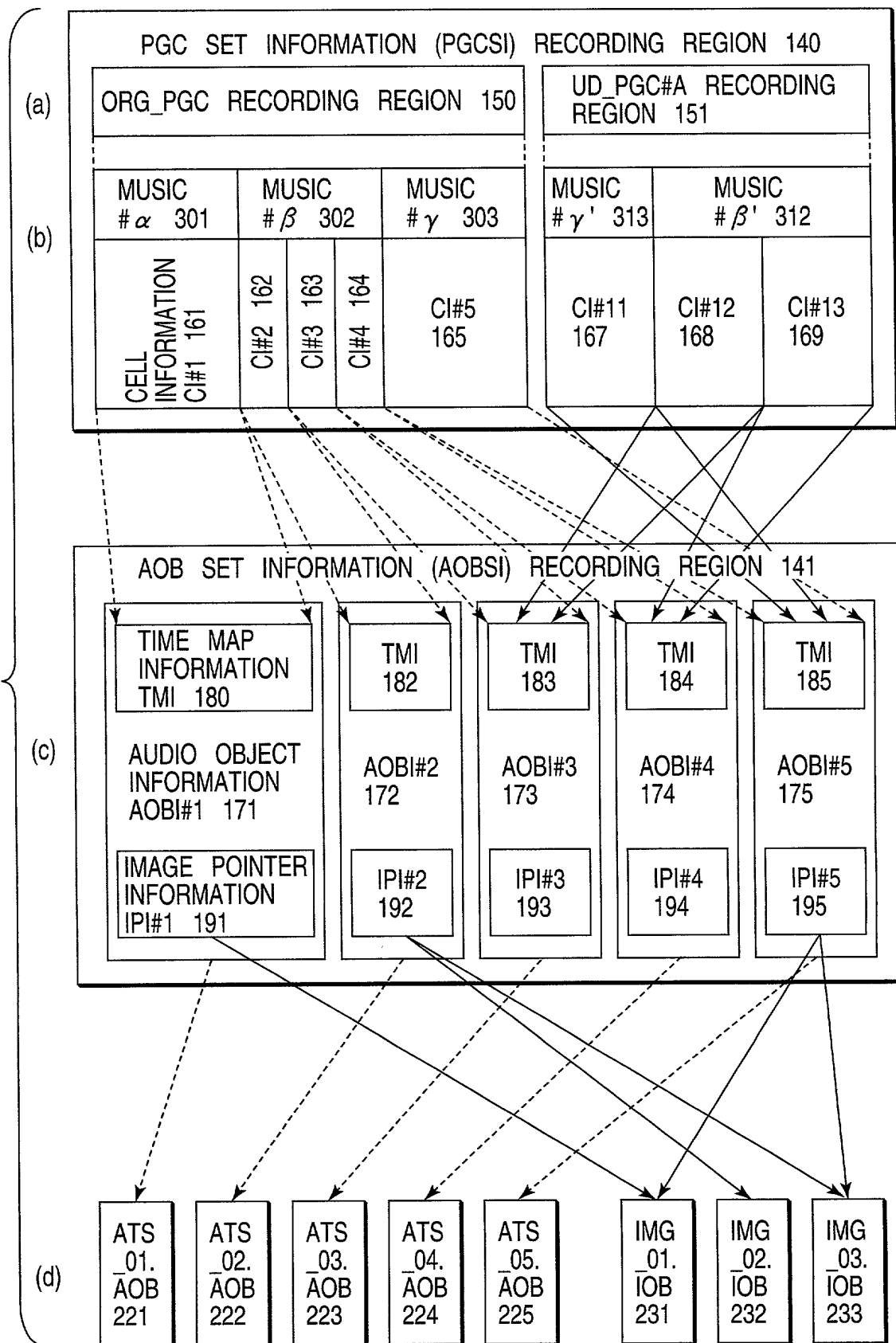


FIG. 6

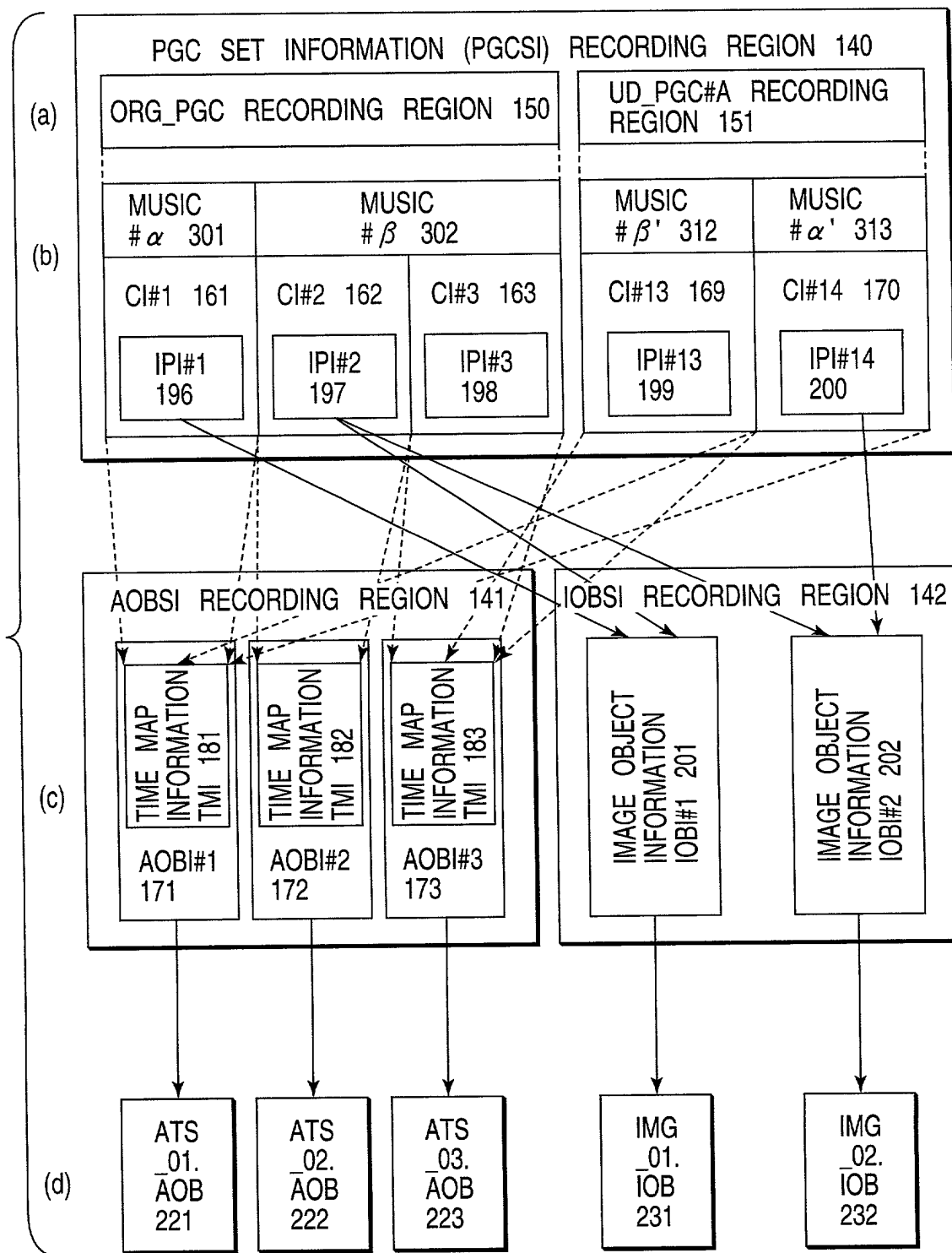


FIG. 7

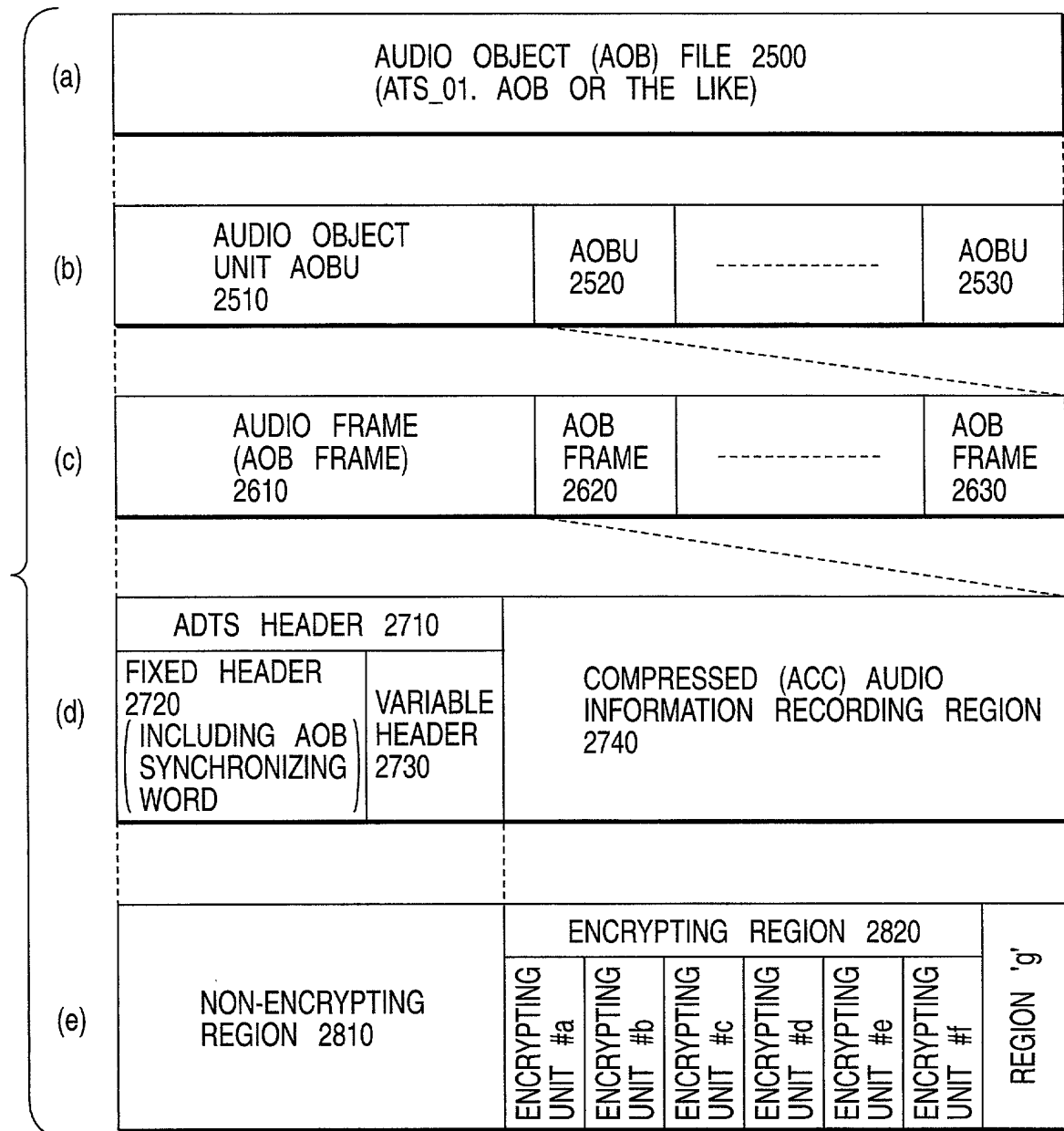


FIG. 8

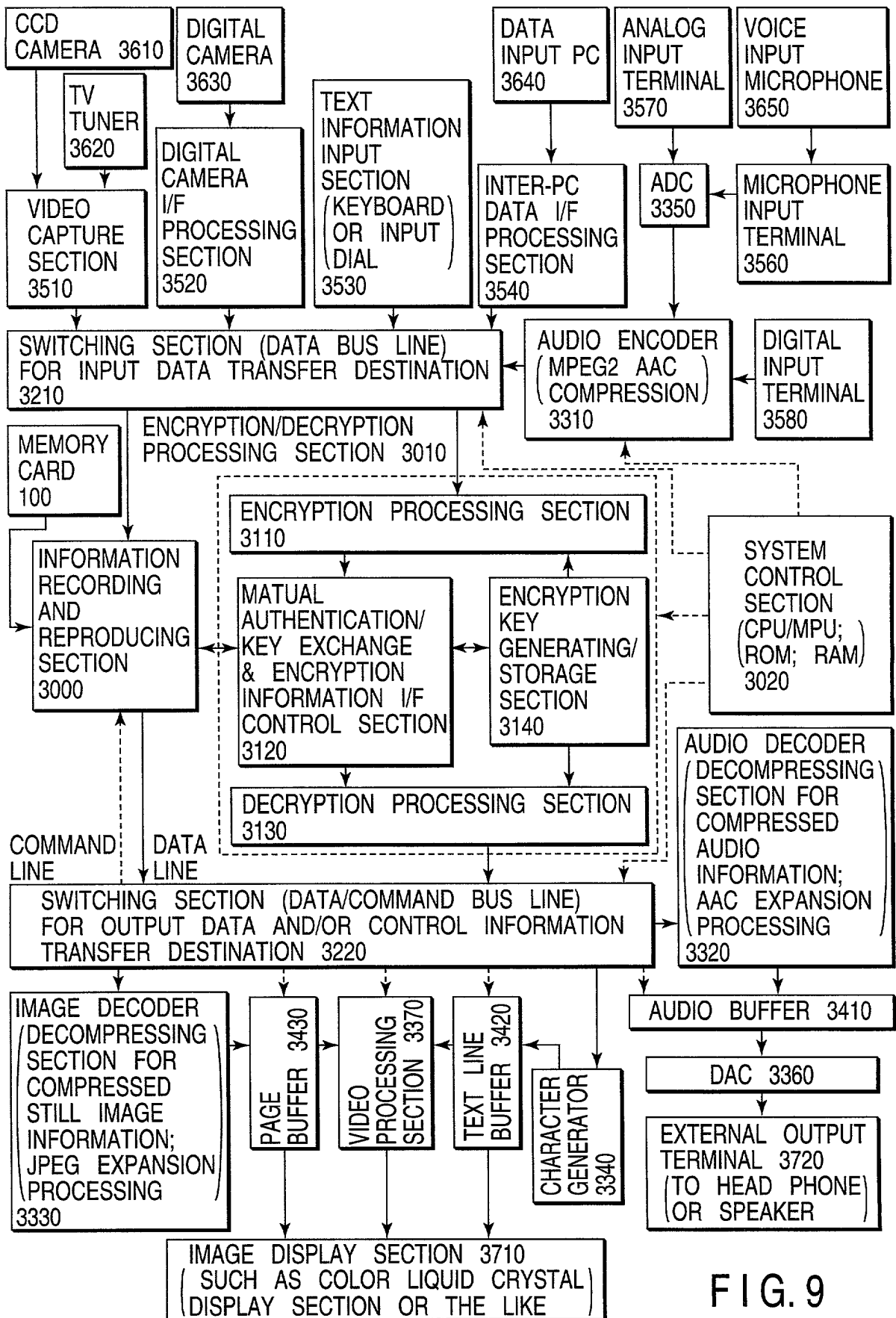


FIG. 9

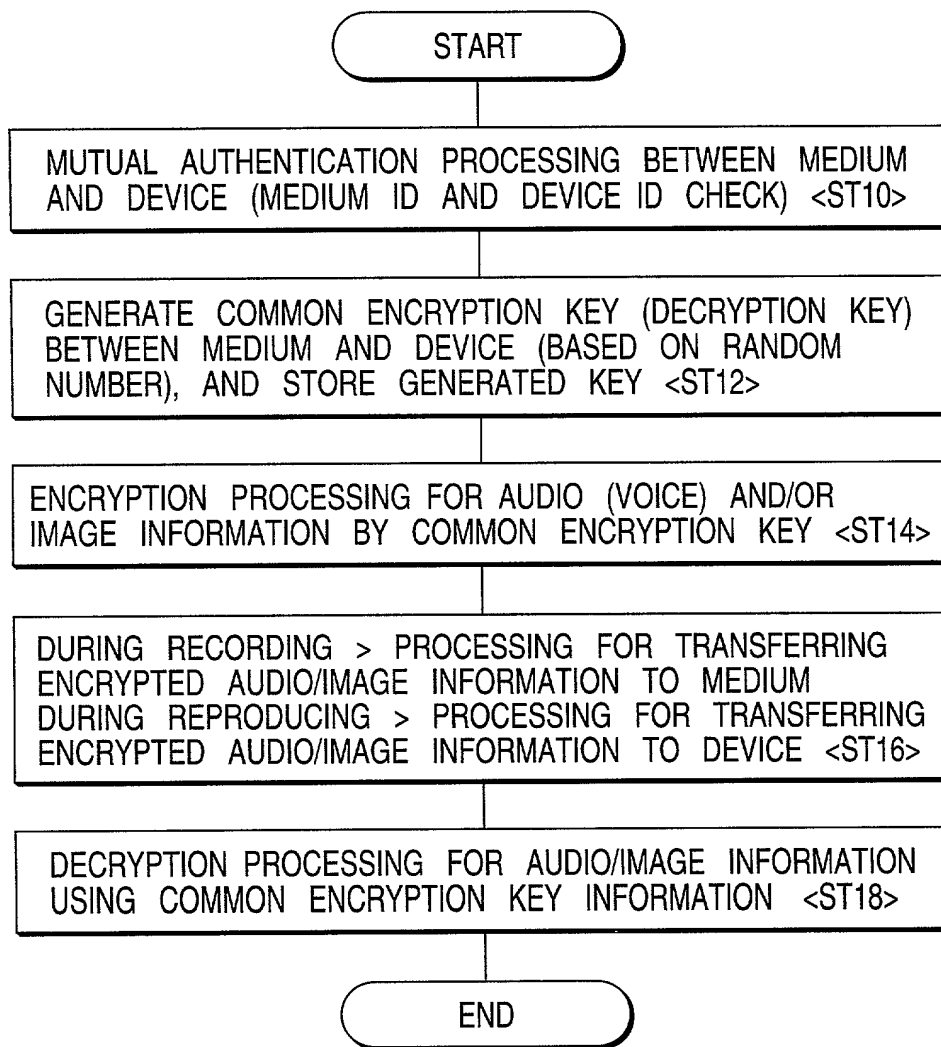
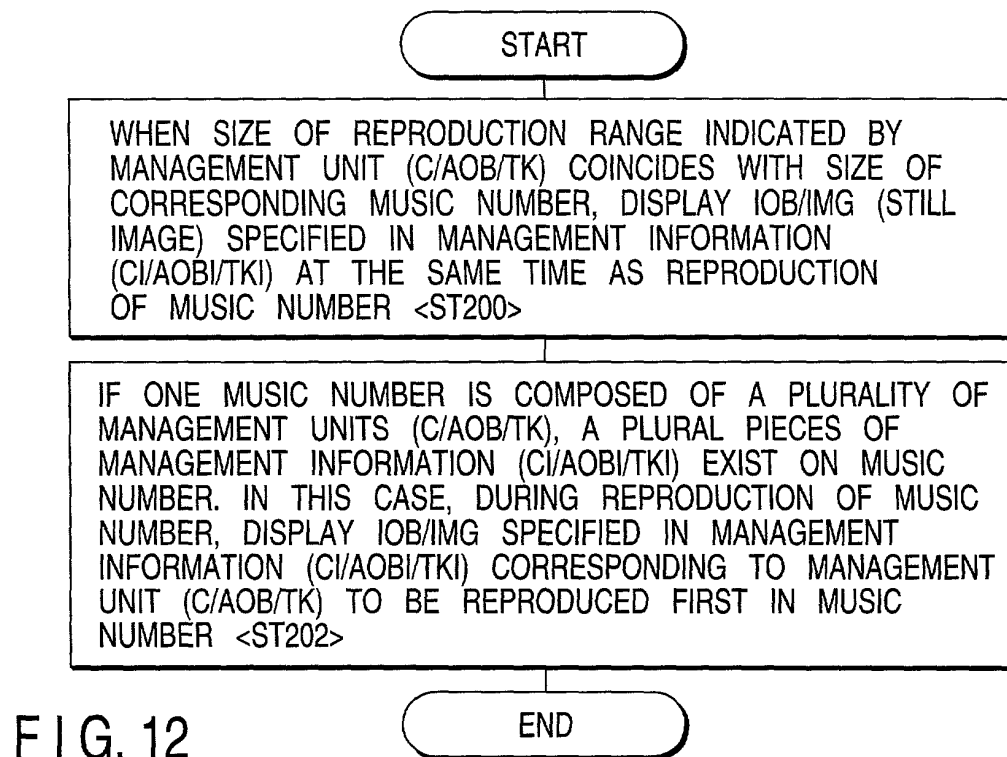
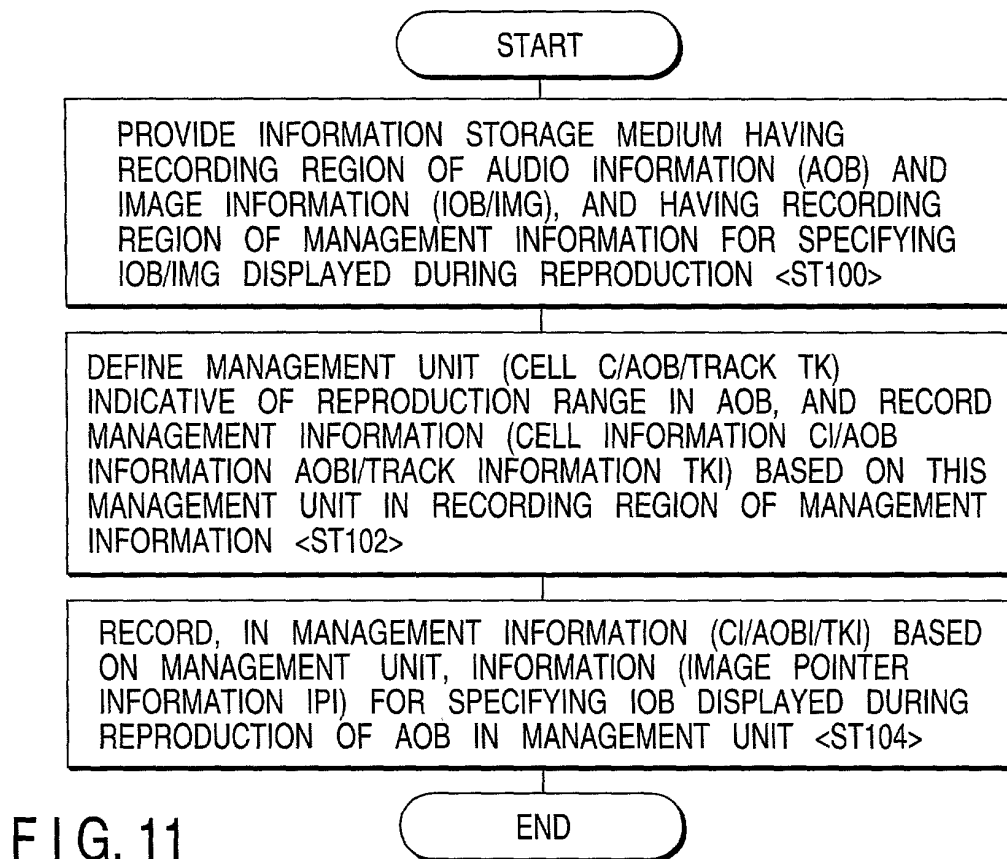


FIG. 10



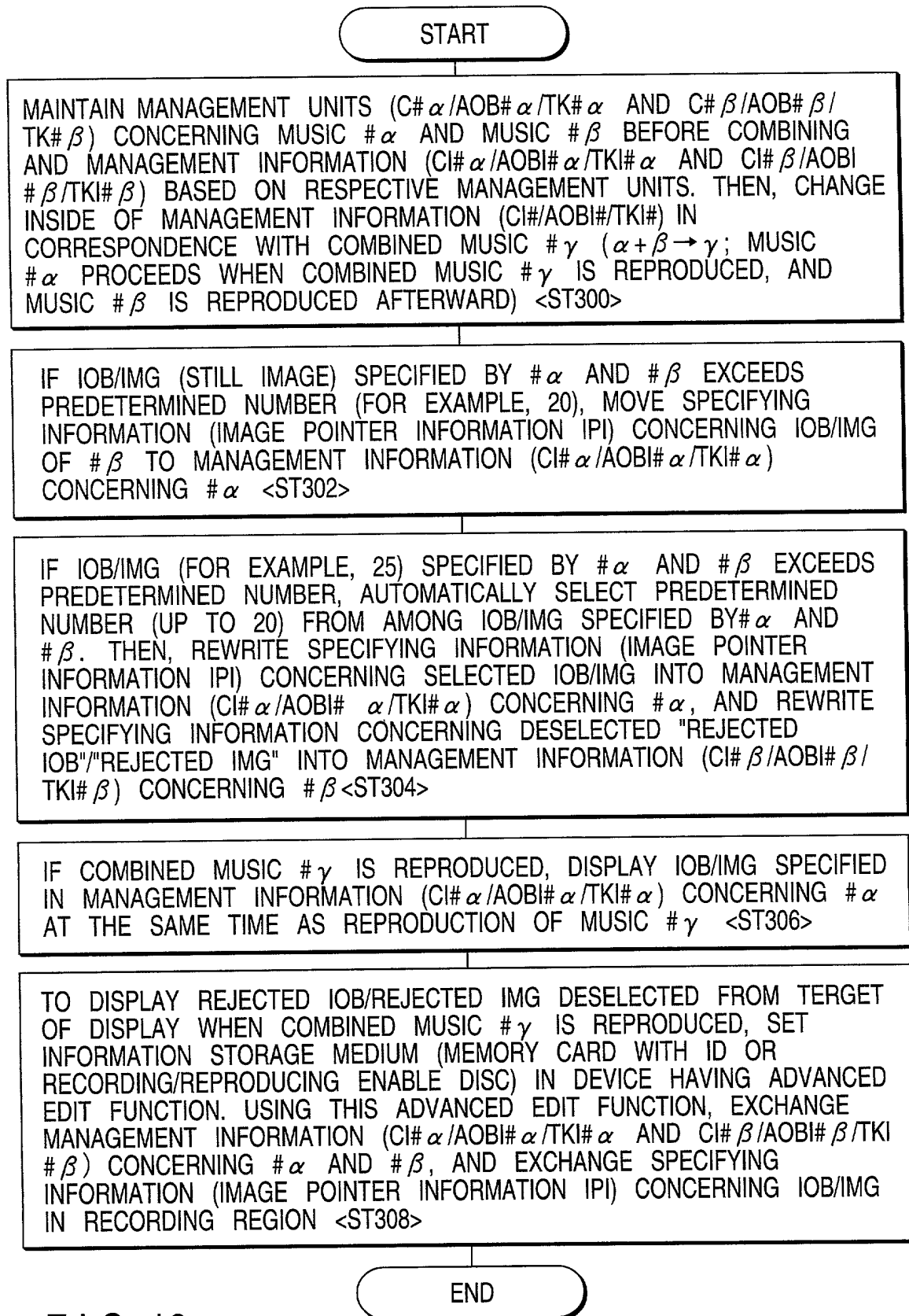


FIG. 13

ENTER

(1) RANDOMLY SHUFFLE NUMBERS OF IOB/IMG POINTERS (FOR EXAMPLE, α IP#1 TO #15) OF $\# \alpha$ AND NUMBERS OF IOB/IMG POINTERS (FOR EXAMPLE, β IP#1 TO #10) OF $\# \beta$, AND SELECT 20 OR LESS POINTER NUMBERS (γ IP#1 TO #20) FROM BEGINNING OF SHUFFLED NUMBERS;
(2) SEQUENTIALLY ARRANGE ODD POINTER NUMBERS (α IP#1, #3, ...) FOR IOB/IMG OF $\# \alpha$; AND EVEN POINTER NUMBERS (β IP#2, #4, ...) FOR IOB/IMG OF $\# \beta$; AND SELECT 20 OR LESS POINTER NUMBERS (γ IP#1 TO #20) FROM BEGINNING OF ARRANGED NUMBERS; OR
(3) COLLECTIVELY ARRANGE IOB/IMG POINTER NUMBERS OF $\# \alpha$ AND $\# \beta$ (FOR EXAMPLE, α IP#1, β IP#1 α IP#2, β IP#2; ..., RESPECTIVELY GROUPED WITH THE SAME NUMBERS), AND SELECT 20 OR LESS POINTER NUMBERS (γ IP#1 TO #20) FROM BEGINNING OF ARRANGED NUMBERS
<ST3040>

RETURN

FIG. 14

START

IN CORRESPONDENCE WITH EACH PLACE OF DIVIDED BOUNDARIES, DIVIDE MANAGEMENT UNIT OF MUSIC $\# \theta$ INTO MANAGEMENT UNIT ($C\# \iota / AOB\# \iota / TK\# \iota$) OF MUSIC $\# \iota$ AND MANAGEMENT UNIT ($C\# \kappa / AOB\# \kappa / TK\# \kappa$) OF MUSIC $\# \kappa$, AND SET MANAGEMENT INFORMATION ($CI\# \iota / AOB\# \iota / TKI\# \iota$ AND $CI\# \kappa / AOB\# \kappa / TKI\# \kappa$) IN ACCORDANCE WITH RESPECTIVE MANAGEMENT UNITS <ST400>

COPY SPECIFYING INFORMATION (IMAGE POINTER IPI) CONCERNING IOB/IMG CORRESPONDING TO MUSIC $\# \theta$, AS SPECIFYING INFORMATION (IMAGE POINTER INFORMATION IPI) CONCERNING IOB/IMG (STILL IMAGE) IN MANAGEMENT INFORMATION ($CI\# \iota / AOB\# \iota / TKI\# \iota$ AND $CI\# \kappa / AOB\# \kappa / TKI\# \kappa$) CORRESPONDING TO MUSIC $\# \iota$ AND MUSIC $\# \kappa$ <ST402>

DISPLAY THE SAME IOB/IMG AS THAT OF MUSIC $\# \theta$ BEFORE DIVISION, WHERE THE DISPLAYED IOB/IMG IS TO BE PRESENTED WHEN MUSIC $\# \iota$ OR MUSIC $\# \kappa$ IS REPRODUCED <ST404>

END

FIG. 15

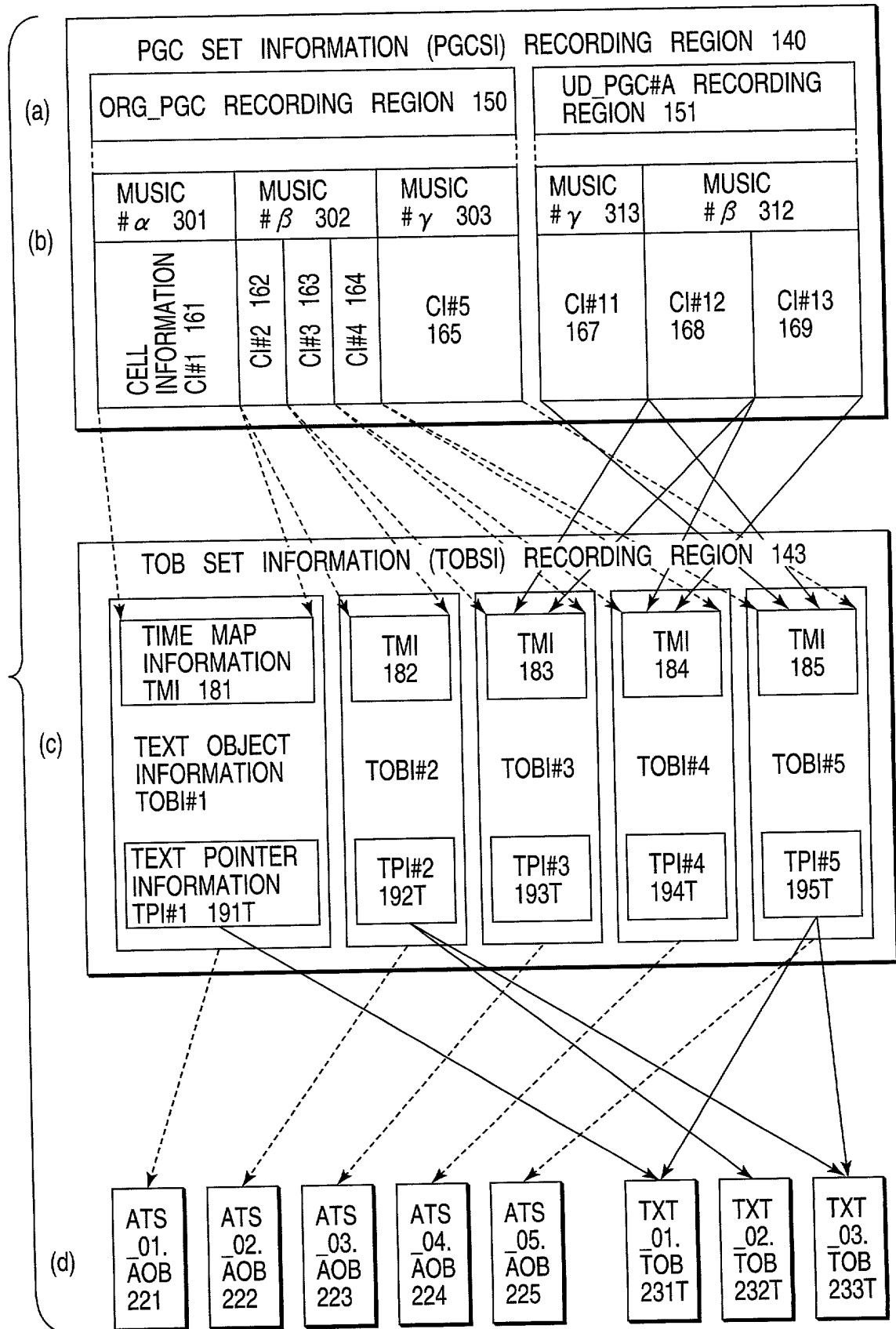


FIG. 16

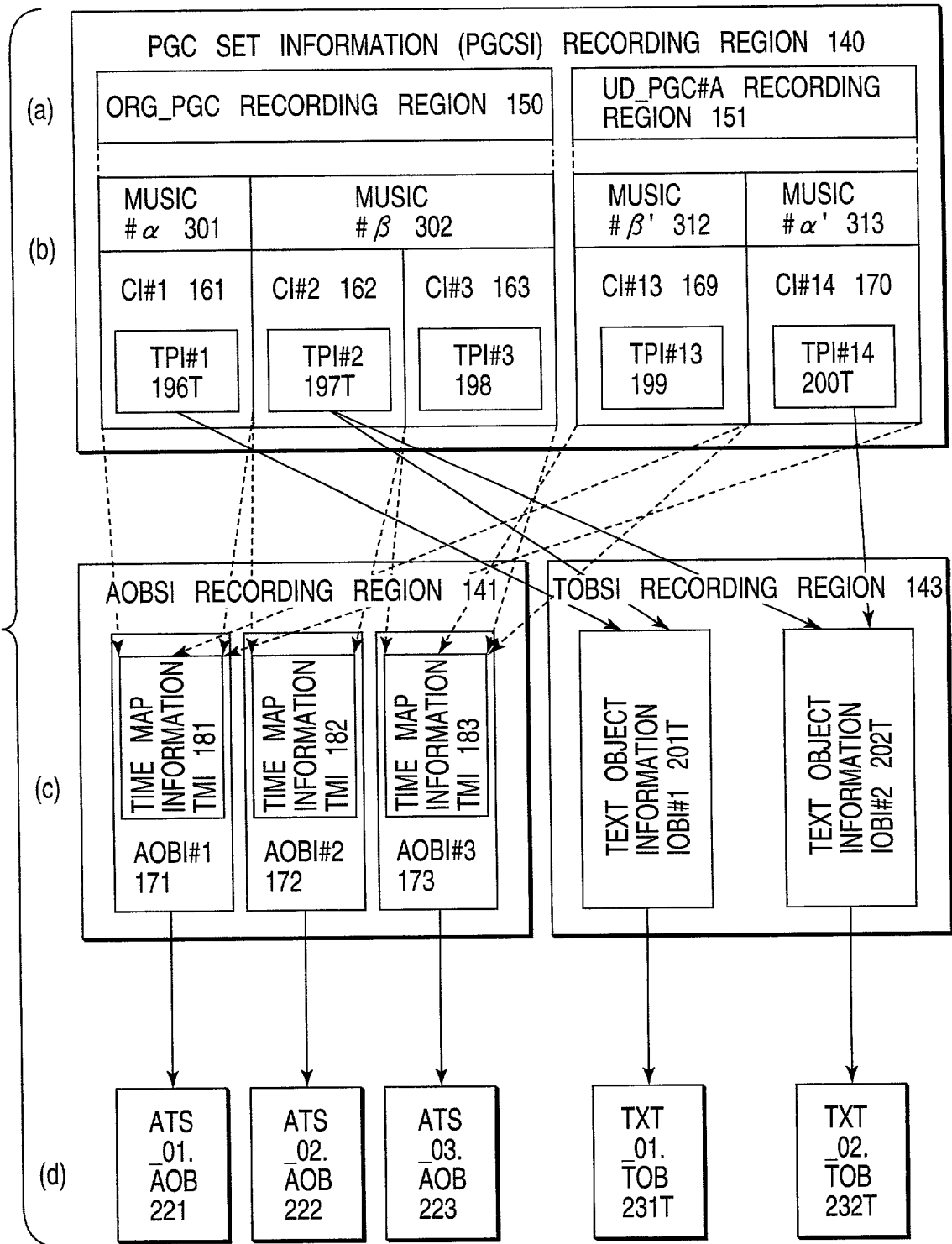


FIG. 17

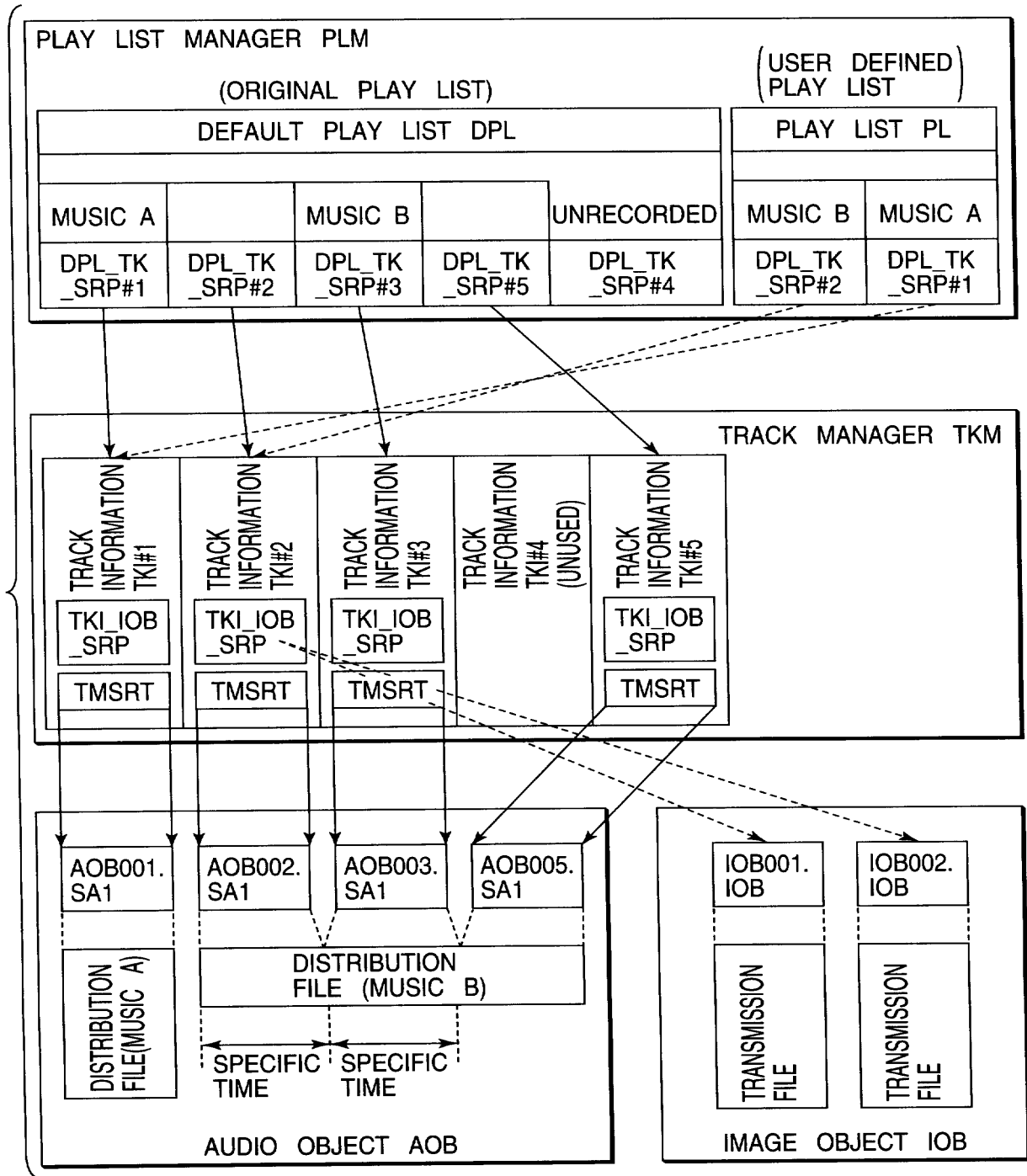


FIG. 18

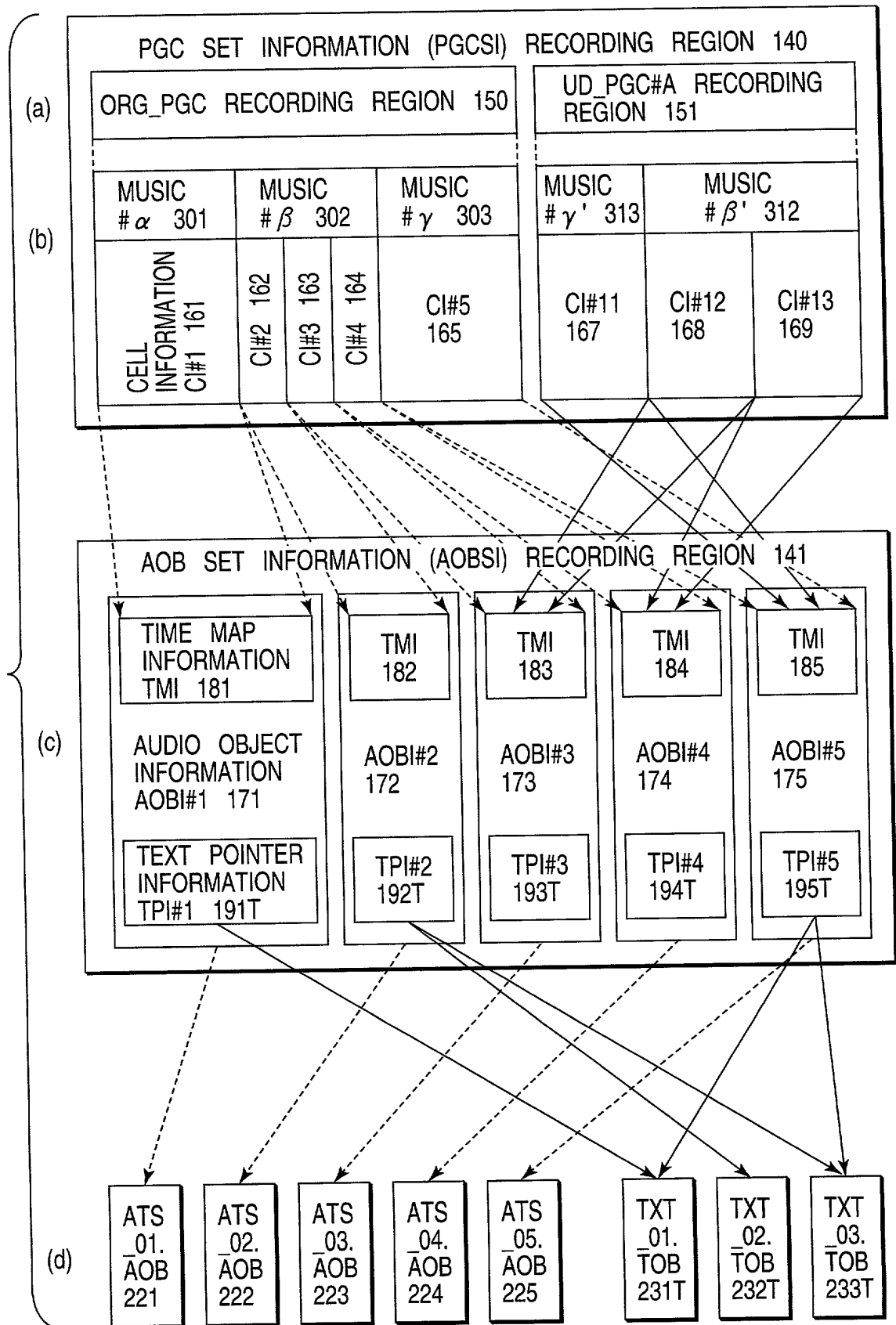


FIG. 19

As a below named inventor, I declare:
that I verily believe myself to be the original, first and sole (if only one
individual inventor is listed below) or an original, first and joint inventor
(if more than one individual inventor is listed below) of the invention in

MEDIUM FOR STORING AUDIO/IMAGE INFORMATION AND
MANAGEMENT SYSTEM THEREOF

the specification of which is attached hereto unless the following box is checked.

☐ was filed on _____ as United States Application
or PCT International Application No. _____, and
was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information of which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365 (b) of any foreign application(s) for patent or inventor's certificate, or 35 U.S.C. 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed:

<u>Country</u>	<u>Category</u>	<u>Application No.</u>	<u>Filing Date</u>	<u>Priority Claim</u>
Japan	Patent	11-275570	September 29, 1999	Yes

And I hereby appoint Douglas B. Henderson (Reg. No. 20, 291), Ford F. Farabow, Jr. (Reg. No. 20, 630), Arthur S. Garrett (Reg. No. 20, 338), Donald R. Dunner (Reg. No. 19, 073), Brian G. Brunsvoild (Reg. No. 22, 593), Tipton D. Jennings, IV (Reg. No. 20, 645), Jerry D. Voight (Reg. No. 23, 020), Laurence R. Hefter (Reg. No. 20, 827), Kenneth E. Payne (Reg. No. 23, 098), Herbert H. Mintz (Reg. No. 26, 691), C. Larry O'Rourke (Reg. No. 26, 014), Albert J. Santorelli (Reg. No. 22, 610), Michael C. Elmer (Reg. No. 25, 857), Richard H. Smith (Reg. No. 20, 609), Stephen L. Peterson (Reg. No. 26, 325), John M. Romary (Reg. No. 26, 331), Bruce C. Zotter (Reg. No. 27, 680), Dennis P. O'Reilley (Reg. No. 27, 932), Allen M. Sokal (Reg. No. 26, 695), Robert D. Bajefsky (Reg. No. 25, 387), Richard L. Stroup (Reg. No. 28, 478), David W. Hill (Reg. No. 28, 220), Thomas L. Irving (Reg. No. 28, 619), Charles E. Lipsey (Reg. No. 28, 165), Thomas W. Winland (Reg. No. 27, 605), Basil J. Lewris (Reg. No. 28, 818), Martin I. Fuchs (Reg. No. 28, 508), E. Robert Yoches (Reg. No. 30, 120), Barry W. Graham (Reg. No. 29, 924), Susan Haberman Griffen (Reg. No. 30, 907), Richard B. Racine (Reg. No. 30, 415), Thomas H. Jenkins (Reg. No. 30, 857), Robert E. Converse, Jr. (Reg. No. 27, 432), Clair X. Mullen, Jr. (Reg. No. 20, 348), Christopher P. Foley (Reg. No. 31, 354), John C. Paul (Reg. No. 30, 413), David M. Kelly (Reg. No. 30, 953), Kenneth J. Meyers (Reg. No. 25, 146), Carol P. Einaudi (Reg. No. 32, 220), Walter Y. Boyd, Jr. (Reg. No. 31, 738), Steven M. Anzalone (Reg. No. 32, 095), Jean B. Fordis (Reg. No. 32, 984), Barbara C. McCurdy (Reg. No. 32, 120), James K. Hammond (Reg. No. 31, 964), Richard V. Burgujian (Reg. No. 31, 744), J. Michael Jakes (Reg. No. 32, 824), Thomas W. Banks (Reg. No. 32, 719), M. Paul Barker (Reg. No. 32, 013) and Charles E. Van Horn (Reg. No. 40, 266), each of whose address is 1300 I Street, N.W., Washington, D.C., 20005-3315, or any one of them, my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent & Trademark Office connected therewith, and request that correspondence be directed to Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P., 1300 I Street, N.W., Washington, D.C., 20005-3315.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I declare further that my post office address is at c/o Intellectual Property Division, KABUSHIKI KAISHA TOSHIBA, 1-1 Shibaura 1-chome, Minato-ku, Tokyo 105-8001, Japan; and that my citizenship and residence are as stated below next to my name:

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Date _____

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Date: Aug. 30, 2000

Citizen of: Japan

Chofu-shi, Japan

Manf-Tarce

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Citizen of: Japan

Date:

Citizen of: Japan

Date:

Citizen of: Japan

Date:

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Date:

Citizen of: Japan